Teesside Survey & Plan

Final report to the Steering Committee

Volume II: Analysis

Part 1

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Foreword

This second and final volume of our report to the Steering Committee contains a detailed account of each of the surveys, analysis and forecasts made by Teesside Survey & Plan between 1965 and 1968. They form the essential basis of the proposals and policies that were described in Volume 1.

Acknowledgement was made in Volume 1 for the assistance and cooperation which we received, when making the surveys, from many people, firms and organisations on Teesside. Nevertheless, we must stress that the responsibility for the analysis and the forecasts is entirely our own, unless the contrary is indicated in a particular instance.

As in Volume 1, 'Teesside' is used throughout this volume to refer to the Teesside Survey Area shown in figure 1.1, and the analysis is described in terms of the local government structure existing at the time of survey, prior to its reorganisation in 1968, when the Teesside County Borough was created.

Finally, it should be noted that the surveys were made during the winter of 1965–66 and the analysis and forecasts were substantially complete by the end of 1967. In the short period since that time there have been changes in the national economy, other factors have varied and indeed the political structure of Teesside itself changed decisively when the new County Borough came into being.

Our analysis and forecasts, however, were designed to give a firm basis to an urban structure policy for Teesside for a period of about twenty-five years. We recognised that there would be short term variations and changes during such a relatively long period of time. But, if our analysis was broadly correct, they might have no more effect than, for instance, to lengthen or shorten the period of time during which the policy could be implemented.

In chapter 7 of Volume 1 we advised that machinery be set up for testing the validity of our analysis and forecasts and, if necessary, reviewing the urban structure policy for the whole of Teesside, including those areas which lie within the new boundaries of County Durham and the North Riding of Yorkshire. The recent economic and political changes show that such a review procedure is all the more vital as part of the means for implementing the proposals of Teesside Survey & Plan.

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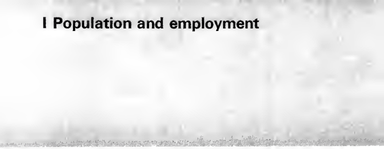
I Population and employment



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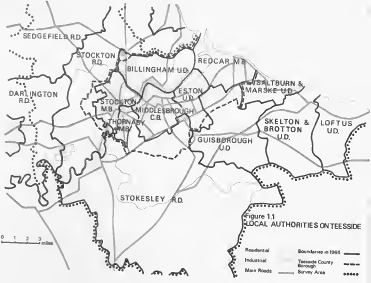

Figure 1.1
LOCAL AUTHORITIES ON TEESSIDE

1 Population

The population forecast

1.1 The population of Teesside in mid-1966 was 479,000. Fifteen years previously, in 1951, it had been about 392,000. Between these dates, population had increased by about 87,000, of which 77,000 was a gain by natural increase, and 10,000 a net gain by migration into the area.

1.2 It was explained in Volume 1 that a fundamental aim of planning policy for Teesside is to encourage the continuance of this pattern. Economic and physical planning, it is assumed, should be directed to sustaining a growth in population for the foreseeable future equal to the natural increase of the indigenous population plus a small net gain by inward migration.

1.3 This concept derives from the North East White Paper (Cmnd. 2206, H.M.S.O., 1963) in which some of the main aims of regional policy for North East England were set out. A further statement of the policy was given in *Challenge of the Changing North*, the report by the Northern Economic Planning Council (H.M.S.O., 1966).

1.4 The economic implications of this policy, and the action necessary for its achievement, are discussed in other chapters of Volume 2. This chapter starts with a brief account of the population projections drawing attention to the main implications and conclusions of the forecasts. Then follows a detailed description of the methods and assumptions used in the forecasts, and tables showing the results of the demographic projection of population in accord with this policy of growth.

1.5 The forecasts of future population are based on separate projections of change by natural increase of the indigenous population and change by migration including with the latter its own natural increase. Both forecasts of change by natural increase use the cohort survival method of projection. The age-sex structure of the population at the starting year of projection is set out. The population is 'aged' by five-yearly increments, for each five years subtracting the number of deaths likely in each age-sex group; and adding the probable number of births, classified into males and females. This method gives a forecast of the total size of population, and its age-sex structure, at five-yearly intervals. The main assumptions concern mortality rates (the number of deaths per 1,000 people), fertility rates (the number of births per 1,000 women), and masculinity rates (the ratio of male births to female births).

1.6 The nature of the statistical sources is such that reliable data about the age-sex structure of the Teesside population are available only from the Census of Population. The projections therefore use 1961 as their starting year. Assumed mortality and fertility age-sex specific rates for Teesside in 1961 were derived by an analysis of national and regional data.

1.7 The main features of mortality and fertility in 1961 were:

a mortality rates, adjusted to make allowance for differences in age structure, were about 10 per cent higher on Teesside than in England and Wales. This differential applied in each age-sex specific group of population and has probably been relatively constant since 1951.

b fertility rates for women aged 15–44 were about 15 per cent higher on Teesside than in England and Wales. The difference between the Teesside and national fertility rate has probably diminished since 1951 in that national rates have been tending to rise more rapidly than local, Teesside rates.

1.8 The assumptions about the future levels of these two sets of rates form the basis for the cohort survival projections. Age-sex specific mortality rates are following a well marked trend for England and Wales. It is assumed that this trend will continue, and that the relative proportionate difference between the Teesside and national rates will remain constant. Thus, by 1991, the age-specific rates will have fallen to 40 per cent of their 1961 level in the younger age groups.

1.9 Age-specific fertility rates present a much greater problem. Two separate issues have been identified. Firstly, there are the Registrar General's assumptions about future national rates. These have varied considerably in recent years, from the 1963 forecast when it was assumed that completed family size would not increase beyond that expected of people married in the late 1950's, to the expectation in the 1965 forecast, that completed family size would continue to increase. To overcome this problem, a range of three sets of assumptions has been used about future national age-specific fertility rates, namely,

A that they rise more rapidly than in the 1965 forecast;
B that they rise at the rate forecast in 1965;
C that they continue at the rate forecast in 1963.

1.10 Secondly, there is the problem of forecasting the future difference between assumed national rates and local, Teesside rates. This difference is substantial but, in recent years, appears to have been falling. A large part of the difference can probably be explained in terms of the relatively high proportion of Roman Catholics in the population, and its relatively low social status. But, as the trend towards a reduction of regional differences continues, the gap between national and local fertility rates is likely to narrow. Thus, two assumptions have been made:

X that the difference between national and local rates continues at its 1961 proportionate level;

Y that the gap is progressively reduced until, by 1991, local rates equal national rates.

1.11 By combining these two sets of assumptions, six alternative forecasts of population change by natural increase are obtained. The results are summarised in table 1.1.

Table 1.1. Summary of population forecasts by natural increase, Teesside 1991

forecast	total population	population aged 15 and over
AX	667,200	454,800
BX	656 100	452,100
CX	634,000	448,600
AY	630,300	446,000
BY	620,800	442 600
CY	605,000	438 800

1.12 The forecasts of natural increase have five important characteristics.

a The total population forecast for 1991 varies considerably, between 605,000 and 667,200 or an increase of population since 1961 of between 36 and 50 per cent by natural increase, excluding the effects of migration. This is, under all assumptions, a considerably faster rate of increase than that forecast in 1965 by the Registrar General for England and Wales, a proportion of 26 per cent for the same period.

b However, much of the variation is caused by the wide difference in the numbers of children under the age of 15 in the different forecasts, between 166,200 and 211,400.

c The numbers of people of working age and over the age of retirement are roughly the same in each of the alternative forecasts to 1991. Whatever the basic assumptions, if the population of Teesside were to grow by natural increase alone, the number of people of working age would rise by between 33 and 39 per cent, to a figure of 360,000 to 375,000; and those of retirement age by 58 per cent, to 80,000. Both of these rates of growth are considerably faster than the comparable rates forecast by the Registrar General for England and Wales. They show an increase of 18 per cent for the population of working age and 30 per cent for those above the age of retirement.

d The different assumptions about fertility rates each lead to the identification of the years around 1991 as a crucial period in the future demographic history of Teesside. Each of the six forecasts shows that up to 1991, the age structure of the population is changing so as to increase the proportion of people under 15 and over 65 in the population. The proportion of people of working age is falling continuously from 1961 to 1991, although the rate of decline is likely to slacken during the 1980's. After about 1991, however, the proportion of people of working age is likely to rise, and the proportion of older people to fall, and Teesside is likely to move into a period with a demographic climate different from that in the 1960's, 1970's and 1980's.

e The forecasts beyond 1991 are very unreliable as a guide to planning policy. The various assumptions lead to a range of forecasts of population in 2011 of between 740,000 and 950,000. This much greater range is a consequence of the geometrical effects of the high fertility rates used in some forecasts during the period before 1991.

1.13 Two main conclusions derive from the forecast range of population and its age structure. The first is that, in the period up to 1991, the rate of increase in the adult population is sufficiently similar under different assumptions for a reasonably reliable forecast to be made of its size. This will be of great importance in forecasting the future demand for new houses and employment, but the forecasts of total population, household size and the demand for education facilities will be much less reliable. The second main conclusion is that even assuming nil migration, it will not be possible to give a reliable forecast of population increase to, say, the year 2011.

1.14 The forecast of migration is based on the policy for Teesside up to 1981 defined in *Challenge of the Changing North*. This involves a net gain by migration to the Teesside area, including the Hartlepools, of 29,000 between 1964 and 1981. Assumptions have been made about the proportion of this net gain that might come within the Teesside Survey area, and the forecast has been extrapolated to 1991. This gives a net gain to Teesside of about 48,000 persons between 1961 and 1991. It is a higher rate of gain than in fact held during the period 1951–65, but not such as to invalidate its acceptance as a reasonable working forecast.

1.15 The forecast of net migration was completed by making an estimate of the likely natural increase of the net migration. It has to be recognised that this estimate is crude, because net migration is not likely to be a constant amount each year and irregularities will affect the yearly natural increase. However, by comparison with the natural increase of the indigenous population, natural increase from the migrants is relatively small, and so the problem is not very significant. It was estimated that this natural increase might be of the order of 14,000.

1.16 Finally the natural increase and migration components have to be aggregated into a single working forecast of the population of Teesside in 1991. The single forecast is necessary for the requirements of detailed, long-term land use and transport planning, where a range of forecasts cannot be utilised in analysis. In selecting the working forecast, three points are relevant. Two have already been mentioned. Firstly, the fundamental character of the population forecast is that of a regional policy goal. The implementation of this policy would be encouraged by Government, and economic and physical planning within Teesside should be directed towards the achievement of this goal. Secondly, future fertility rates are the most unpredictable variable entering the actual projection, and are the least susceptible to government planning. But whatever the assumptions made about future rates, the effect of the alternative assumptions on land use and employment is relatively small in the period to 1991.

1.17 Thirdly, in selecting one forecast for working purposes, most reliance has been placed on the set of assumptions that most closely accord with the experience of the first five years to 1966. During this period, the size and age structure of the population has changed as if the effects of the fertility and mortality rates assumed in forecast AY were being felt, making due allowance for net migration during this period. That is, future national fertility rates are likely to continue to rise, but the difference between national and local fertility rates will diminish to zero by 1991. This projection gives an age structure and size of population for 1966 that is reasonably similar to that revealed by the Home Interview Survey. And its principle of a convergence between national and local rates not only follows a clear past trend, but is a principle to be expected from basic national trends toward closer uniformity in the country, and, in particular, government regional policies. This single, working forecast is given in table 1.2.

Table 1.2. Summary of final population forecast, Teesside, 1991

age group	1966	1976	1991	percentages 1966	1976	1991
0–14 years	132,626	158,787	205,876	27.7	28.4	29.2
15–59/64 years	290,148	331,661	414,415	60.6	59.4	58.8
60/65 years and over	56,096	67,219	83,537	11.7	12.0	11.9
TOTAL (rounded)	478,870	577,667	703,830	100.0	100.0	100.0

Note: actual age groups are 0–14, 15–64, 65 and over, male; 0–14, 15–59, 60 and over, female

1.18 Since this forecast was prepared, the Registrar General has made a new forecast of national population using 1966 data, and assuming lower fertility rates than in the 1965 forecast. However, it has been shown that the effects of these variations in fertility rates have but little effect on the size of the adult population in 1991.

1.19 No reliable forecast of population can be made beyond 1991. The rates of natural increase forecast for the period 1991 to 2011 vary between 140,000 and 280,000, with a mid-point, according to forecast AY, of about 200,000. This last probably gives a rough indication of the likely scale of population growth, but it could be vary different, particularly if migration should follow a different course.

Definitions

1.20 The Teesside Survey Area is made up of local authorities listed in table 1.3 and shown on figure 1.1. It is not possible, however, to project the population of this area by the cohort-survival method as basic data are available only for complete local authority areas. Therefore the projections are made for a slightly different area, the Teesside Population Area, which includes all of Stockton R.D., but excludes the parts of Sedgefield and Darlington R.D.'s contained in the Survey Area.

Table 1.3. Local authorities, Teesside, 1965

	area (acres)	population (mid-1965)
North Riding, Yorkshire:		
Middlesbrough C.B.	7,131	157,180
Eston U.D.	5,167	36,900
Guisborough U.D.	18,948	13,110
Loftus U.D.	9,974	8,120
Redcar M.B.	5,166	35,310
Saltburn and Marske U.D.	3,686	14,240
Skelton and Brotton U.D.	15,419	13,420
Thornaby-on-Tees M.B.	1,925	23,000
Stokesley R.D.	88,940	30,570
County Durham:		
Billingham U.D.	7,856	34,340
Stockton-on-Tees M.B.	5,988	63,220
Darlington R.D. (parts)	11,215	3,730
Sedgefield R.D. (parts)	22,120	7,460
Stockton R.D. (parts)	28,262	10,680
TOTAL, Teesside Survey Area	231,795	473,280

Sources: *Area*, Census of Population, 1961, *County Volumes*.
Population, Mid-Year Estimates for 1965, Registrar General's *Annual Statistical Review*. Population of the parts of Stockton, Sedgefield and Darlington R.D's estimated using Electoral Registers.

Note: for conversion to Teesside Population Area:

	area	population
add: remainder Stockton R.D.	11,829	2,400
delete: Darlington R.D. (parts)	11,215	3,730
Sedgefield R.D. (parts)	22,120	7,460
net adjustment, delete	21,506	8,790
Teesside Population Area	209,285	464,490

1.21 The age-sex structure of the population of the Survey Area is assumed to be similar to that of the Population Area; and consequently, forecasts of the change by natural increase in the former are derived by multiplying changes in the latter by a constant factor of 1.018.

1.22 The forecasts use as basic data the total enumerated population in the 1961 Census. This included the types of population in the Teesside Population Area listed in table 1.4.

Table 1.4. Composition of population, Teesside Population Area, 1961 (per cent)

population in private households	435,790	98.3
institutional, and other population		
resident in hotels	2,668	0.6
resident in hospitals	2,801	0.6
others, including homes, ships, etc.	2,204	0.5
TOTAL, enumerated population	443,463	100.0

Sources: Census of Population, 1961, *County Volumes*.

1.23 The institutional population is small. Precise data about the age structure of this population are not available, but a proportion of it will probably have a similar demographic character to that of the population in private households. It would therefore be unnecessarily complicated to prepare separate forecasts of the two population groups.

Natural increase

1.24 The starting population for forecasting was the enumerated population of the 1961 Census volumes; this is the latest set of figures of the age-sex structure of the Teesside population.

Estimation of starting age-sex specific mortality rates, 1961

1.25 There are no figures of deaths in Teesside according to the age of the deceased and only limited data exist for the Northern Region. After correspondence with the Registrar General's Department, each of the starting age-sex specific mortality rates used in its 1965 forecast for England and Wales was raised by 10 per cent to give an estimate of local rates. This factor represents the differential between national and local mortality rates per 1,000 population in 1961–64, adjusted for the difference in age-sex structure of Teesside compared with that for England and Wales. The validity of the method was tested by applying these assumed rates to the 1961 population of Teesside, to forecast the total number of deaths on Teesside in 1961–1962, and so on, to 1965. The test showed that the assumed rates were a reliable estimate of age-sex specific mortality rates on Teesside in 1961. The starting rates are shown in table 1.5.

Table 1.5. Starting age-specific mortality rates, Teesside, 1961

age group	mortality rate male	mortality rate female	age group	mortality rate male	mortality rate female
0	0.0039	0.0032	45–49	0.0060	0.0038
1–4	0.0009	0.0007	50–54	0.0106	0.0059
5–9	0.0005	0.0003	55–59	0.0168	0.0091
10–14	0.0005	0.000	60–64	0.0318	0.0152
15–19	0.0010	0.0004	65–69	0.0491	0.0283
20–24	0.0012	0.0008	70–74	0.0749	0.0443
25–29	0.0011	0.0006	75–79	0.1130	0.0745
30–34	0.0013	0.0010	80–84	0.1674	0.1224
35–39	0.0021	0.0015	85 and over	0.2486	0.2083
40–44	0.0034	0.0024			

Future mortality rates assumptions

1.26 The assumption about future changes in the Teesside age-specific mortality rates was made after consideration of changes in the England and Wales rates to 2005 assumed by the Registrar General in his 1965 England and Wales forecast, and the likely relationship between these changes and changes in the Teesside rates

1.27 The assumption for England and Wales is that the rates will fall in geometrical progression over the next forty years at about the same pace as they have over the past half century. The trends in national rates are well established, and the Registrar General has not changed his assumptions significantly for a number of years. Accordingly this single assumption about future England and Wales mortality rates can be accepted with confidence.

1.28 It is not certain, however, what will be the future relationship between the England and Wales rates and the Teesside rates. There are two extreme possibilities for future change, first, that Teesside rates remain in the same ratio to national rates as at the present date, second, that the Teesside rates move slowly towards the national rates. It seems most unlikely that local-national differentials will widen in the future. On general arguments it seems reasonable to assume that local rates may move slowly towards national rates. Trends between 1951 and 1964, however, indicate that the local-national differential has remained nearly constant, although there has been a slight tendency for it to decrease in the 1960's (see table 1.6).

1.29 It was unnecessary to use both possible assumptions about future changes because death rates are already very low, and the effects on the future forecast population of assuming a range of plausible mortality assumptions would be slight. It was therefore decided to assume that in future the 1961 ratio between Teesside and England and Wales rates will be maintained, such that the starting rates decline in the same proportions as in the 1965 England and Wales forecast. Thus, by 2001, age-specific mortality rates on Teesside will have declined approximately by the proportions shown in table 1.7.

Table 1.6. Mortality rates, 1951–64 (deaths per 1,000 total population)

	Teesside (adjusted)	England and Wales
1951	14.2	12.5
1952	12.4	11.3
1953	13.1	11.4
1954	13.2	11.3
1955	13.2	11.7
1956	13.8	11.7
1957	13.5	11.5
1958	13.5	11.7
1959	13.0	11.6
1960	13.8	11.5
1961	13.9	12.0
1962	13.1	11.9
1963	12.9	12.2
1964	12.6	11.3

Source: Registrar General's *Annual Statistical Review*, 1951–64, Part II, Table E.

Note: Teesside adjusted rate = national rate × Teesside ratio of local adjusted rate to national rate for the year.

Table 1.7. Ratio of adjusted age-specific mortality rates, Teesside 2001 (1961 rate = 1.00)

age (years)	male	female
0	0.40	0.40
12	0.40	0.40
22	0.40	0.40
32	0.45	0.40
42	0.55	0.45
52	0.63	0.55
62	0.71	0.65
72	0.80	0.78
82	0.90	0.88

Estimation of starting age-specific fertility rates, 1961

1.30 The rates are for 'all women' and include legitimate and illegitimate births. There are no figures of births in Teesside according to the age of mother. The average age-specific rates, 1961–63, for the Northern Region are the most recent figures available. They were applied to the Teesside female population at 1961, the only recent year for which an accurate age distribution is available. The result was that total births were estimated at 15 per cent lower than was actually recorded for 1961–63. There is little variation between regions in the pattern, as opposed to the level, of age-specific rates (see table 1.8). Northern Region rates were therefore increased by 15 per cent to give estimates of Teesside age-specific rates. These estimated rates thus have the same age pattern as those for the Northern Region, but

Table 1.8. Absolute and relative all women's age-specific fertility rates (live births per 1,000 women, annual average, 1961–63)

age group	England and Wales		Northern Region total		Northern Region Tyneside		Northern Region remainder		Merseyside	
	a	r	a	r	a	r	a	r	a	r
15–19	39	0.215	33	0.180	32	0.181	33	0.178	37	0.187
20–24	177	0.977	171	0.934	165	0.937	173	0.935	188	0.960
25–29	191	1.000	183	1.000	176	1.000	185	1.000	196	1.000
30–34	104	0.574	112	0.612	106	0.602	114	0.610	123	0.621
35–39	49	0.255	57	0.311	57	0.324	57	0.308	61	0.309
40–44	14	0.077	16	0.087	17	0.096	18	0.098	19	0.095

Source: Registrar General's *Annual Statistical Review*, 1961–63.

Note: a, absolute rate;
r, relative rate, 25–29 years = 1.000

produce the right numbers of births in each of the years 1961, 1962 and 1963 (see table 1.9).

Table 1.9. Starting age-specific fertility rates, Teesside, 1961 (live births per 1,000 women)

age group	rate
15–19	37
20–24	197
25–29	210
30–34	121
35–39	66
40–44	19

Future fertility rate assumptions

1.31 The forecasts of future births were made in terms of 'all women' five-year age-specific fertility rates. They used as a 'control' the age-specific fertility rates implicit in the Registrar General's 1963 and 1966 forecaste for England and Wales. These implied rates were provided by the Registrar General's Department.

1.32 Two independent sets of assumptions were made: first, about the probable validity of the fertility rates in the Registrar General's 1965 estimates of future population in England and Wales; and second, about the relationship between changes in the Teesside and the national fertility rates. The assumptions were designed to give a likely range of estimates of future population increase.

1.33 Three different assumptions have been made about future national fertility rates, in comparison with the implied assumptions in the Registrar General's forecast for England and Wales made in 1965.

- A The Registrar General's implied assumptions about the rate of increase in age-specific fertility rates between 1966 and 1990 are too low; consequently, for age groups up to 24 the percentage increase of the age-specific fertility rates should be 50 per cent higher than the Registrar General assumes, while the rates for older completed family size of succeeding marriage cohorts slightly greater than that forecast by the Registrar General in 1965.
- B The Registrar General's assumptions in his 1965 forecast are correct, and there would be a small increase in the completed family size of succeeding marriage cohorts.
- C The Registrar General's implied assumptions overestimate the rate of increase of age-specific rates; a better estimate is that they will move towards his 1963 estimates of their 1981 levels, which were lower, and then remain constant. Thus, completed family size would not increase beyond that expected of marriage cohorts married in the late 1950's.

1.34 The first reason behind the use of this range of three assumptions about future national fertility that this is the most important variable in population forecasting, and the most difficult to predict. The Registrar General has revised his fertility assumptions very frequently in recent years, and a range of assumptions is therefore advisable for the purposes of analysis. This is especially important because small changes in the future rates assumed produce very large differences in forecast population.

1.35 Second, the data on which the national forecasts are made have serious limitations. The data are of two kinds, data on past marriage rates and the fertility of past and present marriage cohorts, and data on variables like change income, oral contraception, and so on, which may effect the fertility of future marriage cohorts. The data on the fertility of present marriage cohorts suffer from the serious limitation that there is always a large element of speculation in predicting the completed family size of a marriage cohort whose family completion cycle is not yet finished. At the time of the 1963 forecast the fertility of the most recent marriage cohorts did not appear to be developing in a way significantly different from that of cohorts married in the late 1950's and so the assumption was made that future cohorts would complete families no larger than those expected for the cohorts of the late 1950's. Subsequent trends in fertility resulted in the 1964 and 1966 forecasts assuming a continuing small increase in completed family size in the future, and this results in implicit fertility rates considerably higher than those in the 1963 forecast. This change of assumptions was, inevitably, based on an element of subjective judgement and on data for a very short period, but it resulted in a significant increase in the population forecast for England and Wales 1991. More recently there is some evidence of a slackening in the rise in national fertility rates and it is understood that the 1966 forecast will assume a rise in fertility rates slightly slower than was taken for the 1965 forecast.

1.36 The national forecast assumption of a continuing slow increase in completed family size is also based on analysis of the possible effect of future changes in a number of factors such as the expected rise in real incomes and living standards; the existence of a fashion for larger families; and the effect of improved oral contraceptive methods. The national forecast assumes that on balance the effects of the first two will outweigh the effects of the third so as to produce a slow rise in completed family size. This assumption is again highly subjective. It is by no means certain that rising living standards will increase family size, the evidence on the effects of oral contraception is very limited and conflicting, and little is known about the size of family to which persons recently married aspire.

1.37 Accordingly a range of assumptions about future fertility was used. The medium assumption is the 1965 forecast, the 1963 forecast provides a lowest likely assumption, and an assumption involving higher fertility than the 1965 forecast is included because the possibility of a rise in fertility above that presently foreseen cannot be ruled out.

1.38 Two assumptions were made about the likely future relationship between changes in national and local fertility rates.

- X Each Teesside age-specific fertility rate remains in the same ratio to the corresponding national rate as in 1961.
- Y Teesside rates move towards the national rates. By 1971, the gap is half closed; by 1981 it is three-quarters closed; and by 1991 it is completely closed. This assumption was made after an examination of the likely reasons that would explain the relatively high fertility rates in Teesside. However, the particular rate of change towards the national level was selected arbitrarily, as there is no basis for making a reasoned estimate.

1.39 The assumptions were chosen after considering the following evidence. At the present time the adjusted birth rate per 1,000 women aged 15–44 is about 15

Table 1.10. General fertility rates, 1951–64 (live births per 1,000 women, 15–44 years)

	Teesside (adjusted)	England and Wales
1951	92.0	71.3
1952	92.8	71.5
1953	90.3	73.4
1954	88.1	72.8
1955	91.8	72.7
1956	97.5	76.8
1957	101.5	79.9
1958	105.8	82.0
1959	102.7	82.8
1960	100.5	86.6
1961	105.5	89.4
1962	102.5	90.7
1963	101.0	91.0
1964	98.7	92.2

Source: Registrar General's *Annual Statistical Review*, 1951–64, Part II, Tables E, AA and EE.

Note: Teesside adjusted rate = national rate × Teesside ratio of local adjusted birth rate to national rate for the year.

per cent above the England and Wales rate (see table 1.10). An attempt was made to define the factors accounting for the differential and to assess how they may change in the future. They included:

a the higher than national proportion of Roman Catholic population; this might explain a local differential of +6 per cent (see table 1.11);

b the higher than national proportion of population in the lower socio-economic groups, this might explain about +2 per cent of the differential, though there may be some double counting here with (a) (see table 1.12);

c a possible factor is the higher than national marriage rates of women aged 15–44 years. If the extra women married above the national rates have the same fertility characteristics as the rest of the population (which may not be so), the local fertility rate might be 6 per cent higher on this account (see table 1.13);

d there may be a local tradition of large families, as in Scotland, though again this may be related to (a) and (b).

1.40 It is not at all clear what influence these factors may have in future and how they may effect the future local-national differential. On the face of it, the Roman Catholic factor might be expected to remain stable or increase, but recent debate on contraception makes this questionable. The future influence of the other factors is even more uncertain though on general arguments of the future decline of local differences in a more integrated national culture, it may be that they will slowly decline in significance. On balance these factors may retain some significance in future, but on a declining scale.

1.41 Recent trends 1951–64 in the local adjusted fertility rate per 1,000 women aged 15–44 years were examined and these suggested strongly that the local-national differential has been declining in the past (see table 1.10). However, too much reliance should not be placed on these generalised rates. In 1963–65, for instance, the England and Wales fertility rate per 1,000 women fell, but every age-specific rate continued to rise.

1.42 Consideration was given to the local effects of the factors entering the assumptions about national fertility rates. No firm conclusions were possible, since the factors might not have the same effect on the local demographic and social structure as on the England and Wales structure and the national effects are in any case not certain.

1.43 The general argument, that in future local differences will increasingly be absorbed into a national culture, suggests a slow movement of local fertility characteristics towards forecast national characteristics,

Table 1.11. Roman Catholic population, 1966

area	total population	estimated Catholic population	Catholic population per 1,000 total population
England and Wales	47,000,000	3,965,000	86
County Durham (parts). Teesside including Hartlepool	224,000	32,900	147
North Riding (parts): Teesside	329,000	46,740	142

Sources: *Northern Catholic Calendar 1966* for Diocese of Hexham and Newcastle;
Almanac and Directory 1966 for Diocese of Middlesbrough;
The Catholic Directory 1966;
Civilian Mid-Year Estimates Ministry of Housing and Local Government

Note: the calculation of the effect of varying proportions of Catholic population on fertility rates is based on the assumption that the Catholic fertility rate is twice the average England and Wales rate per 1,000 women aged 15–44. See Department of Economic Affairs, North West Study, Supplement on *The Problems of Merseyside* (H.M.S.O., 1965), p. 38.

Table 1.12. Socio-economic structure, 1951

socio-economic group	per cent of males aged 15 and over in each group		married women's relative fertility rates in each group (group 3 = 100)
	Teesside	England and Wales	England and Wales
1	2	3	103
2	11	15	81
3	49	53	100
4	17	18	111
5	21	13	116

Sources: Census of Population, 1951, *Census Fertility Report*, p. XLV, and *County Volumes*.

Note: average ratio of fertility rate given by applying the specific rate for each socio-economic group for England and Wales to the socio-economic structure of Teesside and England and Wales;

socio-economic structure	average ratio
Teesside	103.2
England and Wales	101.2

and tells against any widening of the local-national differential. This evidence is very limited and inconclusive, but suggests that a slow fall of local rates to forecast England and Wales rates is possible; a maintenance of the present differential is also possible; an increase in the differential is more unlikely. The two assumptions were made accordingly.

1.44 The forecasts of Teesside population were made by combining assumptions A, B, C with X and Y, in turn as follows:

AX the highest forecast: fertility rates rise more rapidly than the Registrar General forecast in 1966, and Teesside rates remain high relative to the rest of the country;

Table 1.13. Marriage rates and fertility, 1961

(a) Proportion of females in age group who are married (per cent)

age group	England and Wales	Teesside
15–19	6.6	6.9
20–24	57.7	63.6
25–29	83.5	87.9
30–34	87.5	90.5
35–39	87.5	90.5
40–44	85.9	89.3

Source: Census of Population, 1961.

(b) Age structure of female population, England and Wales

age group	total
15–19	1,577,000
20–24	1,438,000
25–29	1,400,000
30–34	1,478,000
35–39	1,621,000
40–44	1,554,000
TOTAL, male and female	46,166,000

Source: Registrar General's *Annual Statistical Review*, 1961, Part II.

(c) Estimated age-specific marriage rates (married women per 1,000 total population)

age group	England and Wales	Teesside
15–19	2.3	2.4
20–24	17.9	19.8
25–29	25.3	26.6
30–34	28.0	29.0
35–39	30.7	31.8
40–44	28.9	30.1

Note: given by applying percentage rates in (a) to total population (b).

(d) Married women's age-specific fertility rates, England and Wales (live births per 1,000 married women)

age group	
15–19	465
20–24	276
25–29	201
30–34	110
35–39	51
40–44	15

Source: Registrar General's *Annual Statistical Review*, 1961.

(e) Estimated age-specific birth rates (legitimate births per 1,000 total population)

age group	at England and Wales marriage rates	at Teesside marriage rates
15–19	11	11
20–24	49	55
25–29	51	53
30–34	31	32
35–39	15	16
40–44	4	5
TOTAL	162	172

Note: given by applying England and Wales fertility rates (d) to the estimated numbers of married women (c).

BX the second highest forecast: the Registrar General was correct in his 1965 forecast, but Teesside rates remain significantly higher than national rates;

CX the third highest forecast: fertility rates fail to rise as rapidly as the Registrar General's 1965 forecast, but Teesside rates remain higher than national;

AY the fourth highest forecast: fertility rates rise more rapidly than the Registrar General forecast, but Teesside rates gradually converge towards national rates;

BY the fifth highest forecast: fertility rates rise as the Registrar General forecast, but Teesside rates converge towards national rates;

CY the lowest forecast: fertility rates rise more slowly than forecast by the Registrar General, and Teesside rates converge towards national rates.

1.45 The effects of these different assumptions are demonstrated in tables 1.14, 1.15 and 1.16. Table 1.14 shows age-specific fertility rates for England and Wales in 1961 and 1991 for assumptions A, B and C. Table 1.15 shows the rates for Teesside in 1961 and 1991 in

Table 1.14. Assumed age-specific fertility rates, England and Wales, 1961–91 (live births per 1,000 women)

age group	1961	assumption B 1966	1971	1976	1981	1986	1991	assumption A 1991 and after	assumption C 1981 and after
15–19	38	42	50	52	55	55	55	55	48
20–24	174	179	189	198	200	201	202	215	184
25–29	177	181	180	180	180	181	182	182	172
30–34	103	103	92	87	83	82	83	83	76
35–39	48	47	42	39	37	37	37	37	34
40–44	14	13	13	12	11	11	11	11	11

Source: Registrar General, Government Actuary's Department.

Table 1.15. Assumed alternative age-specific fertility rates, Teesside, 1991 (live births per 1,000 women)

age group	1961	alternative assumptions, 1991 AX	BX	CX	AY	BY	CY
15–19	37	63	55	47	55	55	48
20–24	197	245	229	206	216	202	184
25–29	210	216	216	204	182	182	172
30–34	121	88	86	89	83	83	76
35–39	56	51	51	47	37	37	34
40–44	18	15	15	15	11	11	11

each of the six alternative assumptions. And Table 1.16 gives the rates used for the full AY projection as it is this which is finally selected for the 1991 forecasts of population on Teesside.

Assumptions of future masculinity rates

1.46 Statistics for Teesside 1951–53 and 1961–63 showed a ratio of 105 male births to 100 female births This rate was used for future births in the forecasts

The method of projection

1.47 A cohort-survival technique was employed and use was made of the projection computer programme belonging to the Government Actuary's Department. Starting age-sex specific mortality rates, survival rates and forecast survival rates were calculated by the Government Actuary's Department on the basis of the assumptions mentioned in paragraphs 1.26 to 1.29. The computer then calculated the survivors of the 1961

Table 1.16. Assumed age-specific fertility rates, forecast AY, Teesside, 1961–91 (live births per 1,000 women)

age group	1961	1966	1971	1976	1981	1986	1991 and after
15–19	37	44	51	54	56	61	65
20–24	197	201	205	207	210	213	215
25–29	210	203	196	193	189	185	182
30–34	121	111	102	98	93	86	83
35–39	56	59	52	48	44	40	37
40–44	19	17	15	14	13	12	11

Table 1.17. Summary of alternative population forecasts by natural increase, Teesside, 1961–2011

age group	1961	per cent	1971	per cent	1976	per cent	1981	per cent	1991	per cent	2001	per cent	2011	per cent
Teesside Population Area, forecast AX														
0–14	123,929	*27.9*	144,331	*29.0*	159,344	*29.9*	176,755	*30.8*	212,385	*31.8*	257,649	*32.6*	313,325	*33.0*
15–59/64	269,139	*60.7*	293,339	*58.9*	308,528	*57.8*	325,431	*56.9*	375,063	*56.2*	450,665	*57.0*	547,420	*57.7*
60/65 and over	50,395	*11.4*	60,761	*12.2*	65,921	*12.3*	70,204	*12.2*	79,762	*12.0*	82,303	*10.4*	87,429	*9.2*
TOTAL	443,463		498,431		533,793		573,390		667,210		790,827		948,174	
Teesside Population Area, forecast BX														
0–14	123,929	*27.9*	143,290	*28.8*	156,644	*29.5*	172,002	*30.3*	204,012	*31.1*	243,729	*31.7*	291,703	*32.0*
15–59/64	269,139	*60.7*	293,339	*59.0*	308,528	*58.1*	325,257	*57.4*	372,376	*56.8*	443,259	*57.6*	531,650	*58.4*
60/65 and over	50,395	*11.4*	60,761	*12.2*	65,921	*12.4*	70,204	*12.3*	79,762	*12.2*	82,303	*10.7*	87,429	*9.6*
TOTAL	443,463		497,390		531,093		566,463		656,141		769,291		910,962	
Teesside Population Area, forecast CX														
0–14	123,929	*27.9*	141,064	*28.5*	151,067	*28.7*	162,423	*29.1*	187,401	*29.5*	214,932	*29.6*	249,208	*29.8*
15–59/64	269,139	*60.7*	293,339	*59.2*	308,528	*58.7*	325,829	*58.3*	366,829	*57.9*	427,998	*59.0*	500,328	*59.8*
60/65 and over	50,395	*11.4*	60,761	*12.3*	65,921	*12.8*	70,204	*12.6*	79,762	*12.6*	82,303	*11.3*	87,429	*10.4*
TOTAL	443,463		495,164		525,516		558,456		633,992		725,233		836,965	
Teesside Population Area, forecast AY														
0–14	123,929	*27.9*	139,857	*28.3*	149,523	*28.8*	161,260	*29.0*	185,279	*29.4*	211,460	*29.4*	244,062	*29.5*
15–59/64	269,139	*60.7*	293,339	*59.4*	308,528	*58.9*	325,326	*58.4*	365,296	*58.0*	425,798	*59.2*	495,451	*59.9*
60/65 and over	50,395	*11.4*	60,761	*12.3*	65,921	*12.6*	70,204	*12.6*	79,762	*12.7*	82,303	*11.4*	87,429	*10.6*
TOTAL	443,463		493,957		523,972		556,790		630,328		719,551		826,942	
Teesside Population Area, forecast BY														
0–14	123,929	*27.9*	138,636	*28.1*	146,953	*28.2*	157,269	*28.5*	178,030	*28.7*	199,429	*28.5*	226,696	*28.5*
15–59/64	269,139	*60.7*	293,339	*59.5*	308,528	*58.2*	325,027	*58.8*	362,737	*58.5*	419,182	*59.8*	481,725	*60.5*
60/65 and over	50,395	*11.4*	60,761	*12.3*	65,921	*12.6*	70,204	*12.7*	79,762	*12.9*	82,303	*11.7*	87,429	*11.0*
TOTAL	443,463		492,736		521,402		552,500		620,529		700,914		795,850	
Teesside Population Area, forecast CY														
0–14	123,929	*27.9*	137,045	*27.9*	143,228	*27.7*	151,009	*27.7*	166,248	*27.5*	179,272	*26.7*	197,708	*26.5*
15–59/64	269,139	*60.7*	293,339	*59.7*	308,528	*59.5*	324,669	*59.5*	359,033	*59.3*	408,611	*61.0*	459,651	*61.7*
60/65 and over	50,395	*11.4*	60,761	*12.4*	65,921	*12.7*	70,204	*12.9*	79,762	*13.2*	82,303	*12.3*	87,429	*11.7*
TOTAL	443,463		491,145		517,678		545,882		605,031		670,186		744,688	
Teesside Population Area, Registrar General's 1963 forecast														
0–14	123,912	*27.8*	147,138	*29.2*			167,762	*28.4*						
15–59/64	270,468	*60.8*	294,814	*58.5*			328,927	*57.7*						
60/65 and over	50,370	*11.3*	62,301	*12.4*			73,201	*12.8*						
TOTAL	444,750		504,253				569,890							
England and Wales, Population Area, Registrar General's 1965 forecast (figures in 1,000's)														
0–14	10,586	*23.1*	12,229	*24.5*	13,138	*25.5*	13,711	*25.7*	15,161	*26.2*	17,716	*27.7*		
15–59/64	28,381	*61.9*	29,624	*59.5*	29,923	*58.0*	30,897	*57.9*	33,640	*58.2*	37,330	*58.4*		
60/65 and over	6,885	*15.0*	7,974	*16.0*	8,472	*16.4*	8,740	*16.4*	8,981	*15.5*	8,883	*13.9*		
TOTAL	45,852		49,827		51,533		53,348		57,782		63,929			

Note: actual age groups are 0–14, 15–64, 65 and over, male, 0–14, 15–59, 60 and over, female; percentages show age distribution in specified year.

year, and of an assumed annual number of future births, and printed out the forecast population by five-year age groups for quinquennial time periods. The forecasts were completed by substituting for the assumed births a figure for births calculated by applying the relevant age-specific fertility rates to the female population at quinquennial future dates.

1.48 Summary tables of the six forecasts of population on Teesside are shown in table 1.17, and the changes in population in each forecast is given in table 1.18. Each table includes, for purposes of comparison, the 1965 forecast by the Registrar General for England and Wales, and his 1963 forecast for Teesside.

Migration

Past trends

1.49 Figures of the net annual gain or loss of population between 1951 and 1965 are given for Teesside and for Hartlepool (West Hartlepool C.B., Hartlepool M.B.) in table 1.19. The basic method of estimating annual migration is to compare total civilian population given in successive mid-year estimates by the Registrar General, to deduct from the difference the net gain in population by natural increase and by H.M. Forces returning to civilian life; and to assume that the remainder equals the net migration, inwards or outwards. However, this had to be modified as the mid-year estimates are progressively more liable to error between census years. Thus, for 1960–61, the apparent net gain by migration to Teesside was 9,600 using this method of calculation, compared with a net gain of 2,600 reported in the 10 per cent Sample Migration Analysis (Census of Population, 1961). It was assumed therefore that the mid-year estimate for 1960 was deficient by 7,000 and that this error had accumulated since the 1951 Census in a straight line progression. From this, a revised set of mid-year estimates of population was prepared, and the net annual change by migration calculated.

Table 1.18. Summary of changes by natural increase, alternative forecasts, Teesside, 1961–2011

age group	1961 base population	1961–71 increase	per cent	1971–81 increase	per cent	1961–76 increase	per cent	1961–91 increase	per cent	1961–2011 increase	per cent
Teesside Population Area, forecast AX											
0–14	123,929	20,402	*16.5*	32,424	*22.5*	35,415	*26.6*	68,466	*71.4*	169,396	*152.8*
15–59/64	269,139	24,200	*9.0*	33,092	*11.3*	39,399	*14.6*	105,924	*39.4*	278,281	*103.4*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.5*	15,526	*30.8*	29,357	*58.3*	37,034	*73.5*
TOTAL	443,463	54,968	*12.4*	174,595	*16.0*	90,330	*20.4*	223,747	*50.5*	504,711	*113.8*
Teesside Population Area, forecast BX											
0–14	123,929	19,361	*16.6*	28,712	*20.0*	32,715	*26.4*	80,083	*64.6*	167,774	*135.4*
15–59/64	269,139	24,200	*9.0*	32,916	*11.2*	39,389	*14.6*	103,237	*38.4*	262,711	*97.6*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.5*	15,526	*30.8*	29,357	*58.3*	37,034	*73.5*
TOTAL	443,463	53,927	*12.2*	71,073	*14.3*	87,630	*19.8*	212,579	*48.0*	467,519	*105.4*
Teesside Population Area, forecast CX											
0–14	123,929	17,135	*13.8*	21,359	*15.1*	27,136	*21.9*	63,472	*51.2*	125,279	*101.1*
15–59/64	269,139	24,200	*9.0*	32,490	*11.1*	39,389	*14.6*	97,690	*36.3*	231,189	*85.9*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.5*	15,526	*30.8*	29,357	*58.3*	37,074	*73.5*
TOTAL	443,463	51,701	*11.7*	63,292	*12.8*	82,063	*18.5*	190,519	*43.0*	393,502	*88.7*
Teesside Population Area, forecast AY											
0–14	123,929	15,928	*12.9*	21,403	*15.3*	25,594	*20.7*	61,360	*49.5*	120,133	*96.9*
15–59/64	269,139	24,200	*9.0*	31,987	*10.9*	39,389	*14.6*	96,156	*35.7*	226,312	*84.1*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.5*	15,526	*30.8*	29,357	*58.3*	37,034	*73.6*
TOTAL	443,463	50,494	*11.4*	62,833	*12.7*	80,509	*18.2*	166,663	*42.1*	383,479	*86.6*
Teesside Population Area, forecast BY											
0–14	123,929	14,707	*11.9*	16,633	*13.4*	23,024	*18.6*	54,101	*43.7*	102,767	*82.9*
15–59/64	269,139	24,200	*9.0*	31,686	*10.8*	39,389	*14.6*	93,599	*34.8*	212,566	*79.0*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.5*	15,526	*30.8*	29,357	*58.3*	37,034	*73.5*
TOTAL	443,463	49,273	*11.1*	59,764	*12.2*	77,939	*17.6*	177,056	*39.9*	352,367	*79.5*
Teesside Population Area, forecast CY											
0–14	123,929	13,115	*10.6*	13,964	*10.2*	19,300	*16.6*	42,327	*34.1*	73,777	*59.5*
15–59/64	269,139	24,200	*9.0*	31,330	*10.7*	39,389	*14.6*	89,894	*33.4*	190,412	*70.7*
60/65 and over	50,395	10,366	*20.6*	9,443	*15.6*	15,526	*30.8*	29,357	*58.3*	37,034	*73.6*
TOTAL	443,463	47,682	*10.8*	54,737	*11.1*	74,216	*16.7*	161,566	*36.4*	301,223	*67.9*
Teesside Population Area, Registrar General's 1963 forecast											
0–14	123,912	23,226	*18.7*	20,624	*14.0*						
15–59/64	270,366	24,346	*9.0*	34,113	*11.6*						
60/65 and over	50,370	11,931	*23.7*	10,900	*17.6*						
TOTAL	444,760	59,503	*13.4*	65,637	*13.0*						
England and Wales Population Area, Registrar General's 1965 forecast (figures in 1,000's)											
0–14	10,566	1,643	*15.6*	1,462	*12.1*	2,612	*24.7*	4,575	*43.2*		
15–59/64	26,361	1,243	*4.4*	1,273	*4.3*	1,542	*5.4*	5,259	*18.5*		
60/65 and over	6,685	1,099	*16.8*	766	*9.6*	1,567	*23.1*	2,096	*30.4*		
TOTAL	45,652	3,975	*8.7*	3,521	*7.1*	5,741	*12.5*	11,930	*26.0*		

Table 1.19. Estimated net migration, Teesside and Hartlepool, 1951–65

	Teesside Population Area	Hartlepool
1951–54	−2,357	−2,256
1954–55	+ 373	− 333
1955–56	+1,089	− 250
1956–57	+ 809	− 43
1957–58	+ 860	− 82
1958–59	+2 698	+ 163
1959–60	+2 792	− 253
1960–61	+2 610	+ 15
1961–62	+3,058	+ 169
1962–63	− 52	− 403
1963–64	−1,632	− 704
1964–65	− 432	− 626
TOTAL 1951–65	+9,696	−4 603

Note: Hartlepool includes former West Hartlepool C.B., Hartlepools M.B.

1.50 The data show that for Teesside between 1951 and 1965 there was a small net inward migration of about 10,000. But it is probable that this figure was the result of a net inward movement of around 15,000 in the middle and late 1950's and early 1960's and a net outward movement in the years before and after. The factors behind this history are discussed more fully in chapter 4. In summary, throughout most of the period Teesside, like the rest of the Northern Region, was suffering loss of population by migration, notwithstanding its status as a development area, though the proportional loss was smaller than in the rest of the region. Between 1954 and 1959 there was a period of major capital investment in steel and chemicals on Teesside which resulted in a rise of employment sufficient to induce an inward migration between 1955 and 1962. The yearly pattern of migration in Hartlepool has similarities to Teesside, to be expected in view of the close juxtaposition of the two areas. The data show however that the area was suffering net outward migration on a substantial scale during the period 1951–65.

Future migration assumption

1.51 The Ministry of Housing and Local Government has supplied forecasts for the future showing a small net inward migration to Teesside and Hartlepool, of 11,000 persons, 1964–71 and 18,000, 1971–81. These figures formed the basis, as an assumption of policy, for the forecasts given in *Challenge of the Changing North*. If this is to be a clear goal of national and regional planning, and if Government expenditure on housing, or roads, and control over the location of industry are to be used to this end, the assumptions can be accepted. There is no reason in terms of space, transport potential or regional location to prevent this. Most importantly, if economic development on Teesside is encouraged to continue it is possible that a small net inward migration will continue.

1.52 Give that this small-scale net migration into Teesside and Hartlepool is possible, the question is then, how is it likely to be distributed between the two? They are juxtaposed and growth in one area would affect growth in the other, but it seems likely that net inward migration would mainly be associated with Teesside. It has a much larger population, and in the past fourteen years it received a net inward movement of 10,000, compared with a net outward movement of about 4,000 persons from Hartlepool. In the future, employment growth is probable on Teesside, especially around Eaglescliffe and Thornaby. A major part of the sub-region's committed investment in roads and communications and the major steel and chemical plants are also on Teesside. Finally, a dominant centre for the sub-region should be built up on Teesside and this is likely to be another major employment growth point. In view of these facts it is likely that future net migration into Teesside would be to the Teesside Survey Area rather than to Hartlepool.

1.53 These economic and geographical factors affecting future levels of migration are of vital importance. The levels estimated by the Ministry of Housing and Local Government are reasonably consistent with recent experience, though perhaps on the optimistic side, lower levels of migration are more likely if recent trends are projected into the future. However, as the Ministry's estimates are the basis of *Challenge of the Changing North*, they have been accepted as part of the forecast of population for Teesside. The implications of this level of migration and the measures necessary to sustain it will be discussed in subsequent chapters.

1.54 The estimated gain by migration between 1961 and 1965 was 942, the Ministry forecasts were for a net gain of 11,000 between 1965 and 1971, and 18,000 between 1971 and 1981. Finally, it is assumed that the net gain between 1981 and 1991 will also be 18,000. These figures are set out as assumed rates of migration in each five years in table 1.20. They assume that net migration will take place at a uniform annual rate. No basis is available for making any other assumption, but it is unlikely that net migration will in fact always occur in this way. The net movement for a five-year period may well (as it appears to be doing in 1961–66) include several years of net inward movement and the remaining years of net outward movement, and this will obviously affect the natural increase of the migrants.

Table 1.20. Assumed net migration, Teesside, 1961–91

period	numbers of migrants
1961–66	+2,500
1966–71	+9 420
1971–76	+9,000
1976–81	+9 000
1981–86	+9,000
1986–91	+9,000

Note: 1961–66 includes:
+942, estimated net migration, 1961–65;
+1,558, assumed net migration, 1965–66, at the rate of 11,000 for the period 1965–71.

Forecast of natural increase of assumed net migration

1.55 To complete the projection of migration, a forecast has been made of the natural increase of the assumed net inward migration to 1991. This estimate is only approximate, because a number of assumptions have to be made about the assumed migration. The forecast is of net migration, which is the normal way in which migration forecasts are made. Net migration is known to be the balance of very much larger gross migration movements. The forecast method assumes that the gross movements have no effect on the age-sex structure of the net movement, that is that the gross outward movement has the same age-sex structure as the gross inward movement. Analysis of Teesside migration data from the 1961 Census shows that the age-sex structure and indeed the marital status structure and household structure of immigrants and emigrants are closely similar, so this assumption is valid for past Teesside migration (see table 1.21).

Table 1.21. Teesside migrants, 1960–61

characteristics	immigrants	emigrants
age-sex structure		
male and female, under 15	188	157
male, 15–44	273	203
female, 15–44	231	185
male, 45–64	52	34
female, 45–59	35	30
male, 65 and over	16	17
female, 60 and over	29	32
marital status		
married males	240	178
married females	225	173
household size		
1 person	11	12
2 persons	43	39
3 persons	50	33
4–5 persons	51	44
6 and over persons	5	7

Source 10 per cent Sample, Census of Population, 1961, *Special Migration Analysis* (obtained from Registrar General, August, 1966).

Note: data are for Teesside Population Area excluding Guisborough, Loftus, Skelton and Brotton

The age-sex structure of net migration

1.56 It was necessary for a cohort survival forecast to make assumptions about the age-sex structure of the forecast total net migration. The assumptions were that the age-sex structure of net migrants in the future would remain constant, and that it would be the same as in the Census data on migrants to Teesside 1960–61. The data are for ten large age-sex groups. Using these data as a model, a breakdown into five-year age-sex groups was made, using two sources. The main source was data on the age-sex structure of Teesside net migration 1951–61, prepared by Professor House and Miss E. M. Knight of Newcastle University. These data are for five-year age-sex groups and were obtained by a 'net survivor' technique using 1951 and 1961 Census data. The other source was a paper on the age-sex structure of net in-migrants assumed in the England and Wales population forecasts, provided by the General Register Office. From these sources, an assumed age-sex structure of the migrant population was constructed (see table 1.22). The available data indicate a striking similarity of age-sex structure for areas of very different size, for different scales of migration and for different directions of net flow.

Assumptions about fertility and mortality

1.57 The size of the migrant population is sufficiently small to permit the use of a series of assumptions designed to simplify the method to be used in the forecast of natural increase. In particular, the use of a range of assumptions about future fertility rates seemed unnecessary as, by 1991, the total growth in population caused by the natural increase of the migrant population is only of the order of 14,000 people. This is a very small figure in comparison with the forecast migration of 48,000, or the natural increase of the original population.

1.58 It was assumed, firstly, that no mortality occured within each batch of migrants during the five-year period in which it arrived on Teesside. This will lead to a slight over-estimate of natural increase, although the age structure of the migrants is such that deaths would be few. Secondly, an estimate was made of the number of births occurring to each batch of migrants during the five-year period in which it arrived on Teesside, as follows:

> live births to women in each fertile age group = 2.5 × appropriate fertility rate from natural increase forecast AY × number of women in the age group at end of period.

This estimate was included because the young age structure would produce a significant number of births. After their arrival on Teesside, fertility and mortality rates for each group of the migrant population were assumed to be the same as those assumed in natural increase forecast AY.

Results of the population forecast

1.59 The evidence of births and deaths during the period 1961 to 1966 suggests that the forecast of natural increase AY is currently the most reasonable set of assumptions if the forecast for 1966 using that assumption is corrected to allow for the difference between the Teesside Population Area and the Teesside Survey Area; and if the effects of migration between 1961 and 1966, and its natural increase, is added in to give the total population. Further, the age-sex structure of this population forecast for 1966 is very similar to that derived from the Home Interview Survey. Therefore, for the purposes of planning, assumption AY, with the correction for area, and the addition of the assumed migration and its natural increase is given in table 1.24 as the working forecast of population for Teesside to 1991.

1.60 It must be remembered, however, that five years is too short a time to establish the reliability of a forecast. The natural increase assumption actually implies that the national fertility rates will continue to

Table 1.22. Assumed age-sex structure of net migration, Teesside, 1961–91

age group	migrants 1961–6		migrants 1966–71		migrants per five years, 1971–91	
	male	female	male	female	male	female
0–4	+ 67	+ 87	+252	+252	+243	+243
5–9	+ 87	+ 67	+252	+252	+369	+243
10–14	+101	+ 89	+382	+338	+389	+324
15–19	+133	+ 89	+503	+338	+477	+324
20–24	+235	+159	+886	+597	+648	+576
25–29	+235	+159	+885	+597	+648	+576
30–34	+202	+137	+760	+509	+720	+486
35–39	+133	+ 89	+503	+338	+477	+324
40–44	+101	+ 67	+382	+252	+389	+243
45–49	+ 83	+ 34	+313	+128	+297	+
50–54	+ 67	+ 21	+252	+ 81	+243	+ 81
55–59	+ 67	+ 21	+252	+ 81	+243	+ 81
60–64	+ 87	− 21	+252	− 81	+243	− 81
65 and over	− 18	− 21	− 59	− 81	− 72	− 81
TOTAL (rounded)	1,540	960	5,804	3,616	5,544	3,456

rise but that local rates will converge towards national rates. The validity of this assumption can be tested only by experience, and cannot be directly affected by land use or transportation planning policy. The assumed levels of migration are more susceptible to manipulations by Government policy. Their implications will be examined more fully in later chapters. In the meanwhile, it should be borne in mind that the comparatively narrow range of alternative assumptions about natural increase results in the following range of forecasts for the 1991 population of Teesside:

natural increase AX, plus migration	742,000
natural increase AY, plus migration	704,000
natural increase CY, plus migration	680,000

However, the effects of this wide range are somewhat reduced when, in subsequent sections, these population forecasts are translated into effective demands for new houses, and for employment. As will be shown, the effects of the alternative assumptions about fertility on each of these is very slight during the period to 1991.

1.61 The situation for the period after 1991 is much more uncertain. The forecasts of natural increase were given to the year 2011 in table 1.17 but the forecasts are statistical abstractions, almost devoid of meaning, as is shown by their range in table 1.23.

Table 1.23. Possible natural increase in population, Teesside, 1991–2011

	2011	increase 1991–2011
natural increase AX	966 000	+286,000
natural increase AY	845,000	+203,000
natural increase CX	760,000	+142 000

Note: data adjusted for Teesside Survey Area.

1.62 If to this is added the impossible task of forecasting migration for a period nearly half a century in the future, it can well be seen that no reliable, even tentative, forecast can be made of the population of Teesside in 2011. For the sake of giving a factor of scale to any consideration of long term planning beyond 1991, an increment of 200,000 people in twenty years is suggested but this is not a forecast, nor is it a projection, it is a quite arbitrary figure that might be of the right scale.

Table 1.24. Population forecast, Teesside Survey Area, 1961–91 (total population)

age group	1961		1966				1971			
	AY	AY+	AY	AY+	M	T	AY	AY+	M	T
0–4	44,405	45 323	46,432	47,266	402	47,670	46,314	50,201	1,607	51 808
5–9	38,872	39 574	44 336	45 134	134	45 268	46 280	47,114	897	48,011
10–14	40,552	41,282	38,800	39,498	190	39,688	44,263	35,059	862	45 811
15–19	31,012	31,570	40 449	41 177	222	41,399	38 714	39,411	1,030	40,441
20–24	27,430	27,921	30,891	31,447	394	31,841	40,306	41,031	1,800	42 831
25–29	28,987	29 609	27,316	27,806	394	28 200	30,711	31,325	1,776	33,101
30–34	31,347	31,912	28 847	28 366	339	29,705	27,199	27,689	1,871	29,630
35–39	32,509	33 502	31,127	31,687	222	31,909	28,667	29,182	1,186	30,368
40–44	29,221	29 748	32,548	33,132	168	33,300	30,815	31,370	863	32,233
45–49	27,870	28 371	28,888	28,205	117	29 322	31,996	32,572	606	33,078
50–54	26,766	27,268	27,013	27 600	88	27,588	27,867	28,368	444	28 812
55–59	24,250	24,686	26,415	26,873	88	25,961	25,714	26,176	404	26,580
60–64	18,964	20 314	22,118	22,514	46	22,560	23 362	23,782	261	24 033
65–69	15,100	15,371	17,323	17 635	−39	17,596	19 285	19,632	−85	19 547
70–74	11,348	11,550	12,120	12 338		12,338	13 981	14,233		14,233
75–79	7,523	7,658	7,942	8 085		8,085	8 586	8,739		8 739
80–84	4,056	4 129	4 281	4 357		4,357	4,587	4,669		4 669
85 and over	1,743	1,774	2 046	2,083		2,083	2,252	2,293		2,293
TOTAL	443,463	451,468	467,688	476,105	2,766	478,870	493,957	502,848	13,002	515,849

age group	1976				1981				1991			
	AY	AY+	M	T	AY	AY+	M	T	AY	AY+	M	T
0–4	54 143	55,117	3 099	58,216	58,164	59 201	4,455	63 656	65,636	66,816	6,410	73 226
5–9	49 170	50,055	1,877	51,932	54,002	54 973	3,567	58 540	61,888	62,795	5,609	68 404
10–14	46,210	47 041	1,598	48,639	49,104	49 967	2,783	52,770	57,958	59,000	5,248	64,248
15–19	44 175	44,969	1,648	46,617	46 128	46,958	2,394	49,353	53 861	54,829	4,908	59,737
20–24	38 592	39 286	2,502	41,788	44,051	44,843	3,124	47,967	48,817	49,796	4,734	54,530
25–29	40 188	40,891	3,061	43,952	38,475	38,167	3,869	43,036	45,801	46,726	4 976	51,702
30–34	30 688	31,207	3,004	34,211	40,027	40,747	4,189	44,936	43,810	44,697	5,395	49,892
35–39	27,046	27 532	2,365	29,897	30,504	31,062	3,692	34 744	36,197	38,883	5,546	44 429
40–44	28 401	28,913	1,723	30,636	26 820	27,302	2,897	30,199	39,561	40,272	5,293	45 565
45–49	30,330	30,876	1,201	32,077	27 891	28,495	2,053	30 548	29,810	30,448	4,468	34,916
50–54	31,140	31,700	671	32,371	29 564	30,085	1,463	31,548	25,883	26,358	3,420	29 778
55–59	26,008	27,084	717	27,801	29 806	30,443	1,126	31,569	26 262	26,754	2,488	29 242
60–64	23 740	24,167	489	24,656	24 681	25,105	767	25 872	26,456	26,933	1,714	28,647
65–69	20,482	20,851	79	20,930	20,933	21,309	288	21,597	24,703	25,147	952	26 099
70–74	15,650	15,931	45	15,976	16 729	17,026	239	17,267	18,117	18,443	584	19,027
75–79	9,972	10,151		10,151	11 228	11,429	69	11,498	12,561	12,786	270	13,056
80–84	5,031	5,121		5,121	5,882	5,982		5,982	7,236	7,365	102	7,467
85 and over	2,461	2,506		2,506	2,731	2,779		2,779	3,640	3,706		3,705
TOTAL	523,872	533,398	24,289	557,687	556,780	566,897	36 964	603,861	630,328	641,653	62,177	703,830

Notes: AY, forecast of change by natural increase, Teesside Population Area;
AY+, adjusted forecast of change by natural increase, Teesside Survey Area;
M, net gain by migration and its natural increase, Teesside Survey Area;
T, total population forecast, Teesside Survey Area;
figures should be rounded

Table 1.24. Population forecast, Teesside Survey Area, 1961–91 (male population)

age group	1961		1966				1971			
	AY	AY+	AY	AY+	M	T	AY	AY+	M	T
0–4	22,666	23,323	23,714	24,141	202	24,343	25,193	25,646	815	25,461
5–9	19,709	20,064	22,791	23,201	67	23,268	23,627	24,053	446	24,499
10–14	20,930	21,307	19,665	20 020	101	20,721	22,747	23,156	446	23,602
15–19	15,766	16,050	20,858	21,233	133	21,366	18,607	19,960	502	20,562
20–24	13,360	13,600	15,678	15,961	235	16,196	20,755	21,129	1,010	22,139
25–29	14,832	15,089	13,285	13,524	235	13,759	15,596	15,879	1,120	16,999
30–34	16,203	16,495	14,747	15,012	202	16,214	13,217	13,455	1,000	11,455
35–39	15,770	17,072	16,075	16,362	133	16,495	14,640	14,903	709	15,612
40–44	14,966	15,235	16,556	16,854	101	16,955	15,864	16,170	515	15,685
45–49	14,140	14,394	14,645	14,809	83	14,992	16,224	16,516	309	16,825
50–54	13,560	13 824	13,604	13,850	67	13,917	14,124	14,378	330	14,708
55–59	12,030	12,246	12,673	12,801	67	12,968	12,743	12,972	306	13 278
60–64	9,327	8,495	10,664	10,856	67	10,923	11,291	11,484	308	11 802
65–69	6,420	5,535	7,667	7,606	−18	7,767	8,834	6 893	−7	8,986
70–74	4,527	4,506	4,745	4,628		4,628	5,723	5,826		5,826
75–79	2,620	2,671	2,630	2,861		2,681	3,006	3,060		3,060
80–84	1,500	1,527	1,377	1,401		1,401	1,399	1,424		1,424
85 and over	573	563	614	625		625	566	597		597
TOTAL	220,341	224,328	232,168	236,364	1,676	236,039	245,196	249,611	7,909	257,520

age group	1976				1981				1991			
	AY	AY+	M	T	AY	AY+	M	T	AY	AY+	M	T
0–4	27,666	28,166	1,580	28,748	29,726	30,261	2,275	32,536	33,563	34,167	3,277	37,444
5–9	25,111	25,583	848	26,412	27,587	28,063	1,813	29,896	31,530	32,097	2,859	34,958
10–14	23,565	24,009	620	24,629	26,071	25,522	1,428	26,950	29,611	30,143	2,822	32,855
15–19	22,665	23,093	930	24,023	23,529	23,952	1,305	25,257	27,495	27,969	2,576	30,567
20–24	18,519	19,670	1,479	21,349	22,596	23,002	1,613	24,615	24,939	25,387	2,636	26,026
25–29	20,661	21,033	1,829	22,662	28,441	19,790	2,265	22,085	23,370	23,790	2,845	26,636
30–34	15,528	15,807	1,797	17,604	20,574	20,944	2,807	23,451	22,439	22,842	3,174	26,018
35–39	13,126	13,364	1,412	14,776	15,437	15,714	2,206	17,920	19,271	19,617	3,302	22,919
40–44	14,480	14,741	1,027	15,768	12,697	13,230	1,726	14,958	20,265	20,550	3,156	23,805
45–49	15,565	15,666	766	16,632	14,220	14,462	1,277	15,759	15,070	15,341	2,706	18,047
50–54	15,676	15,961	612	16,573	15,090	15,361	962	16,323	12,425	12,648	2,133	14,781
55–59	13,280	13,519	535	14,054	14,787	15,053	603	15,656	13,088	13,323	1,610	14,633
60–64	11,415	11,620	511	12,131	11,960	12,175	700	12,875	12,963	13,196	1,268	14,484
65–69	9,417	9,587	148	8,736	6,589	9,781	308	10,070	11,390	11,595	749	12,344
70–74	6,657	6,777	45	6,822	7,164	7,282	178	7,461	7,837	7,976	456	6,434
75–79	3,672	3,738		3,736	4,315	4,392	30	4,422	4,662	4,849	218	5,167
80–84	1,611	1,538		1,538	1,663	1,695		1,698	2,431	2,474	93	2,567
85 and over	695	606		606	645	656		656	951	968		986
TOTAL	260,176	264,656	14,341	279,199	276,592	281,556	21,630	303,166	313,520	319,154	35,886	355,039

Notes: see table 1.24, total population.

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Table 1.24. Population forecast, Teesside Survey Area, 1961–91 (female population)

age group	1961		1966				1971			
	AY	AY+	AY	AY+	M	T	AY	AY+	M	T
0–4	21,917	22,006	22,718	23,127	200	23,327	24,121	24,666	792	25,347
5–9	18,193	19,510	21 545	21,903	97	22,000	22,653	23,061	451	23,512
10–14	19 622	18,975	19,134	19,478	89	19,567	21 818	21,903	406	22,309
15–19	15 246	15,520	19,591	19,944	89	20 033	19,107	19,451	428	19 879
20–24	14,068	14,321	15 212	15 486	159	15,645	19,550	19 892	590	20 482
25–29	14 155	14,410	14,030	14,282	159	14,441	16,173	16,448	688	18,102
30–34	15,144	15,417	14,100	14,354	137	14,491	13,992	14,234	671	14,905
35–39	16,140	16,430	16,064	16,325	89	16,414	14,027	14,279	477	14,756
40–44	14,258	14,513	15,990	18,258	87	18,345	14,931	15,200	348	15,548
45–49	13,730	13,977	14 043	14,296	34	14 330	15,772	16,056	197	16,253
50–54	13,208	13,444	13,409	13,650	21	13,671	13,743	13,990	114	14,104
55–59	12,220	12 440	12,743	12,972	21	12,993	12,971	13,204	98	13,302
60–64	10,627	10,819	11,482	11,658	−21	11,637	12,071	12,288	−57	12,231
65–69	8,660	8,836	9 656	9,830	−21	9,809	10,451	10,639	−78	10,561
70–74	6,819	6,942	7 377	7,510		7,510	8,258	8,407		8,407
75–79	4,703	4,787	5,112	5 204		5,204	5,579	5,679		5,679
80–84	2,566	2,602	2,904	2 955		2,955	3,188	3,245		3,245
85 and over	1,170	1,191	1,432	1,458		1,458	1,666	1,696		1,696
TOTAL	223,122	227,140	236,602	239,741	1,090	240,831	248,769	253,235	5,093	258,328

age group	1976				1981				1991			
	AY	AY+	M	T	AY	AY+	M	T	AY	AY+	M	T
0–4	26,476	26,951	1,519	28,470	28,428	28,940	2,180	31,120	32 072	32,649	3,133	35,782
5–9	24 098	24 492	1,028	25,520	26,415	26,890	1,754	28,644	30,158	30,698	2,750	33,448
10–14	22,625	23,032	778	23,810	24,033	24,465	1,355	25,820	28,347	28,857	2,426	31,283
15–19	21,490	21 876	718	22 594	22,600	23 007	1,089	24,096	26,388	26,840	2,330	29,170
20–24	18,073	19,416	1,023	20,439	21,455	21,841	1,311	23,152	23,978	24,409	2,155	26,564
25–29	19,507	19,858	1,232	21,090	19,034	19,377	1,574	20,951	22,531	22,936	2,131	25 067
30–34	15,128	15,400	1,207	16,607	19,453	19,803	1,682	21,485	21,371	21,755	2,221	23,976
35–39	13,918	14,168	953	15,121	15,087	15,338	1,486	16,824	18,926	19,266	2,244	21,510
40–44	13,921	14,172	696	14,868	13,823	14,072	1,169	15,241	18,276	19,622	2,137	21,759
45–49	14,745	15,010	435	15,445	13,765	14,013	776	14,789	14,840	15,107	1,762	16,869
50–54	15,491	16,739	259	16,998	14,474	14,734	491	15,225	13,468	13,710	1,287	14,997
55–59	13,325	13,565	182	13,747	15,018	15,390	323	15,713	13,194	13,431	878	14,309
60–64	12,325	12,547	−12	12,535	12,701	12,930	57	12,987	13,495	13,737	446	14,183
65–69	11,065	11,264	−70	11,194	11,344	11,548	−21	11,527	13,313	13,552	203	13,755
70–74	8,993	9,164		9,164	9,675	9,747	59	9,806	10,280	10,465	128	10,593
75–79	6,300	6,413		6,413	6,913	7,037	39	7,076	7,699	7,837	52	7,889
80–84	3,520	3 583		3,583	4,014	4,088		4,088	4,805	4,891	9	4,900
85 and over	1,868	1,900		1,900	2,086	2,123		2,123	2,689	2,737		2,737
TOTAL	263,789	268,540	9,948	278,488	280,198	286,341	15,334	300,855	319 806	322,489	26,292	348,791

Notes: see table 1 24, total population.

2 Labour supply

Activity rates and labour supply

2.1 The number of people currently at work on Teesside is about 197,000 and is expected to rise by about 61 per cent, to 316,000, by 1991. The complete employment situation on Teesside at any one time, however, is the result of the interaction of four factors, given by the equation that the number of workers resident on Teesside (including those registered as unemployed) plus the net inward travel-to-work from areas outside Teesside equals the number of jobs on Teesside plus the registered unemployed in the area. The method of forecasting future employment situations on Teesside is to make separate predictions about each of these four factors in such a way that the equation balances if a consistent set of assumptions is used about the factors. This chapter describes the first of these predictions, the number of resident workers; the other three are described in chapters 3 and 6.

2.2 It was stated in Volume I, chapter 2, that the population policy for Teesside is in the nature of a goal, a target population to be achieved by conscious planning as well as by more general forces of economic and social change. The technique of making the population forecast was described in chapter 1 of this volume. The resident working population can therefore be calculated by applying activity rates to that forecast population, an activity rate being the proportion of a population which is at work, or registered as unemployed. The calculation is described in this chapter, attention being given mainly to the underlying assumptions made about future activity rates on Teesside.

2.3 It was noted in chapter 1 that the variation in the population of working age (15–64 years for males; 15–59 for females) resulting from different assumptions about fertility rates was comparatively small. By 1991, the extreme range of values would be 408,000 to 424,000, allowing for the net inward migration required by this policy. It was also suggested that a simple set of assumptions about natural increase (forecast AY) was in greatest accord with recent trends and generally the most likely forecast. Therefore, the forecast of working population in this chapter is derived from the single, final forecast of population given in table 1.24. That is, the population of working age in 1991 will be about 415,000 with a likely range between −1.6 per cent and +2.4 per cent, allowing for the different assumptions about natural increase in table 1.17.

2.4 The method of preparing the forecast of working population is conditioned by the absence of reliable age-sex specific activity rates for any area smaller than England and Wales, and for any data more recent than 1961. Forecasts of age-sex specific activity rates have been made by the Ministry of Labour only for Great Britain.

2.5 Therefore, the following method is used for preparing forecasts of the Teesside working population.

a National age-sex specific rates for 1961 are applied to the Teesside population to give an assumed estimate of working population in 1961.

b This estimate is compared with the actual working population derived from the 1961 Census of Population, showing that the estimate of male workers is too low by 3.7 per cent and that for female workers is too high by 20.7 per cent. These proportions are described as the 'regional factors' for Teesside.

c Forecasts of national age-sex specific activity rates are applied to the forecasts of Teesside population to 1991. The national forecasts are those of the Ministry of Labour 1981, extrapolated for a further ten years to 1991.

d The forecasts of estimated working population on Teesside are modified by the application of assumed regional factors. On the basis of trends and policy these are taken to have fallen to zero by 1991 for both males and females. That is, roughly, the local age-sex specific activity rates will have changed so that they equal the forecast national rates by 1991.

2.6 The regional factors are therefore the crucial elements in the calculation. Their values for 1961 are given confirmation by the general activity rates for males and females aged 16 and over, for which evidence is available from the Census (see table 2.1).

Table 2.1. General activity rates (per cent)

	male 15 and over		female 15 and over	
	1951	1961	1951	1961
England and Wales	87.5	86.2	34.8	37.7
Teesside Population Area	89.2	86.9	28.9	31.4

Source: Census of Population 1951, 1961, *Occupation Tables*, economically active population.

2.7 The situation revealed for 1966 by the Ministry of Labour data and the Home Interview Survey shows that the area was still being affected by the severe cyclical recession in the area's economy since 1961. This is discussed more fully in chapter 4 but it means that the 1961 figures must form the basis for future, long term forecasts while the full implications of the 1966 figures and the short term forecasts are discussed in chapter 4.

Male activity rates

2.8 Male activity rates on Teesside are higher than the national rates. The difference, however, is very slight and the evidence from the Home Interview and Employment Surveys shows that there must have been a fairly rapid fall in the local rates since 1961, probably following the rise in unemployment on Teesside in 1962–63.

2.9 The Ministry of Labour forecasts assume that activity rates in the age group 25–64 are likely to remain roughly constant. The big change lies in the fall in activity rates forecast for the age group 15–24 as the school leaving age is raised to 16, and as opportunities for full-time higher education are extended. A fall is also forecast in the activity rates for people above retirement age (see table 2.8).

2.10 It is assumed that the regional factor for male working population will gradually disappear so that, by 1991, the application of the national age-specific activity rates to the Teesside population will give a reasonable forecast of the working population. This policy is derived from the desirability and expectation of seeing a diminution of regional disparities as opportunities for higher education are made more widespread. The decision of the Government to provide a polytechnic at Middlesbrough and the expectation of a technical university in the longer term, are both portents of this trend. But even if the policy should fail, and the regional factor remains at its 1961 level, this would mean an increase of only 3 per cent in the forecast of the male working population in Teesside.

Female activity rates

2.11 Female activity rates present greater problems of analysis as the rates are substantially lower on Teesside than nationally. The regional factor in 1961 showed that the actual working population was 20 per cent less than the application of national age-specific rates would suggest. And the general activity rate for females aged 15 and over was only 31.4 per cent compared with 37.7 per cent in England and Wales. The low level of female activity is thrown into even more striking relief when the Teesside rate is compared with the standard conurbations identified in the Census of Population, 1961 (see table 2.2).

Table 2.2. General female activity rates, Conurbations, 1961 (per cent)

South East Lancashire	46.1
London	45.6
West Midlands	44.5
West Yorkshire	44.1
Merseyside	35.9
Tyneside	35.2

Source: see table 2.1.
Note: rates are for females aged 15 and over.

2.12 The traditional view is that the present low rates are a consequence of the comparatively few opportunities for women to work in an area where the main industries are steel, shipbuilding, heavy engineering and chemicals; where shift working by men is prevalent; and where local tradition and the high birth rate may also be contributory factors.

2.13 The real situation, however, is more complex and makes more difficult the attempt to forecast future activity rates. A feature which, at first sight, casts doubt on the traditional explanation is that employers seeking female labour have in the last four years been finding difficulty in recruiting sufficient workers. This may result from the slow assimilation of a new attitude by women to the prospect of going out to work in, say, the service industries and the post-war light manufacturing industries which are the main types of opportunity for women. The reports of difficulty in the recruitment of labour are much less frequently heard from those firms, few in number on Teesside, which are located close to new working-class residential areas. Local activity rates tend to be higher in local authority housing estates, particularly in those with a greater local supply of jobs. The implication is that the presence of opportunities for work and, therefore, possibly a higher female activity rate, may be encouraged through placing suitable industry near residential areas.

2.14 A further likely cause of the apparent shortage of female labour is that since 1959 the growth in service employment has been rapid. It may have temporarily exhausted the available supply of female labour at the time of survey, autumn 1965 to summer 1966, when unemployment, both male and female, was particularly low throughout North East England.

2.15 Evidence of one reason why women may not work was gathered during a survey of 268 adult women living in the Berwick Hills and Ayresome districts of Middlesbrough. The survey, sponsored by the North East Development Council, showed that 38.8 per cent of the women were already working; 22.8 per cent would be able to work, provided certain conditions were fulfilled; and 38.4 per cent were unable to work. For most women in the middle category, the missing condition was the provision of nursery schools for their children. This report identifies a recent reserve of female labour. It is however the only survey of attitudes to employment that has been made on Teesside. It is a small sample on which to base judgement, but it does perhaps afford an indication of the existance of reserves of female labour.

2.16 Finally, the low activity rates may possibly be related to the incidence of part-time work undertaken by women on Teesside. The employment situation in 1966 is by no means clear, but it appears that large numbers of women were in part-time employment (see table 2.3). These figures have been deduced from Ministry of Labour data, the Employment Survey and the Home Interview Survey. The Ministry of Labour include only those people working more than ten hours weekly and the Home Interview is the sole source of evidence for the scale of employment of less than ten hours weekly. The Census of Population does not clearly set a lower limit for the definition of part-time employment but, in national terms, it includes 6.5 per cent less females than the Ministry of Labour working population. But the Home Interview Survey asked that everyone who worked for any length of time should report the fact. It seems probable that the survey recorded many housewives who spend a few hours, say, in domestic service, or as a part-time shop assistant but who do not possess an insurance card or did not report any occupation to the Census, other than 'housewife'.

Table 2.3. Estimated full and part-time female employment, Teesside, 1966

full-time employment, over 30 hours weekly	42,000
part-time employment,	
10–30 hours weekly	16,000
less than 10 hours weekly	25,000

2.17 It is relevant to consider at this point whether these part-time workers should be taken into account in the forecasts of future female activity rates as employment for less than ten hours weekly does not enter the conventional definitions of an activity rate by the Ministry of Labour or the Census of Population. The

Home Interview Survey seems to show that about 14 per cent woman aged 16 years and over work for less than ten hours weekly, compared with 34 per cent who work for more than ten hours. The first problem of interpretation is that no data is available to suggest whether this is a normal or an abnormal situation compared with other parts of the country. If the proportion is higher than usual, it might mean that any increase in conventional activity rates could be achieved only by a decline in the proportion of women doing this part-time work. It seems possible, however, that the part-time rates are high because conventional rates are low. The lack of opportunity for full-time work may mean that many women undertake a few hours work to supplement family incomes and that, if the opportunity presented itself, they would prefer a steadier, better paid job even if it involved more normal hours.

2.18 This problem of the motivation, scale and character of part-time employment should be investigated in greater detail. For the purposes of physical planning, however, it seems likely that this type of work is largely irrelevant. Part-time workers engaged, typically in evening shifts; in Saturday work in shops; or in office, schools or domestic cleaning, do not require additional floorspace or the provision of additional transport facilities within an urban structure plan. On the hypothesis that this part-time work is a substitute for work for more than ten hours weekly, the conventional activity rates are accepted as a basis for forecasting future employment.

2.19 The forecast of conventional activity rates made for Great Britain by the Ministry of Labour shows a fall in age-specific rates in the younger age groups, under 35 years, as opportunities for full-time education increase in the youngest age groups, and as the trend to younger marriages continues. Age-specific rates amongst women over 35 are expected to rise, following the pattern of recent trends (see table 2.8).

2.20 It is assumed that the tendency for Teesside rates to be lower than the national will diminish until, by 1991, the two sets of age-specific rates will be equal. This assumes that patterns of behaviour on Teesside will tend to become closer to national patterns. It assumes that the apparent recent shortage of female labour is a short-term phenomenon associated with the cyclical performance of the Teesside economy in recent years. It assumes, also, that the part-time employment phenomenon will not, on balance, affect the performance of conventional activity rates.

The forecasts

2.21 The forecasts show that the resident male working population is likely to rise by a minimum of 35 per cent, from 149,000 in 1966 to 202,000 in 1991. The resident female working population is likely to rise by a maximum of 70 per cent, from 60,000 in 1966 to 102,000 in 1991 (see table 2.12).

2.22 There are three sources of error in these forecasts.

a There is the straightforward error arising from the possible variations in population growth by natural increase. This is comparatively small. It would lead to the male working population being about 4,000 higher, or 2,000 lower than forecast. The estimates of the female population could be 2,500 higher, or 1,000 lower than forecast.

b There are the effects of migration. The estimates include about 24,000 male workers and 8,000 female. The arrival of these workers on Teesside is dependent on Government policy and economic growth and the range of error is not predictable.

c The activity rates also give a cause for possible errors in the forecasts. These, too, are not predictable as the activity rates used are a statement about policy for Teesside in the context of the national forecasts by the Ministry of Labour. It is safe only to say that the male activity rates are probably the lowest likely, and for females, the activity rates are the highest likely. Possible margins of error can be derived by an examination of the slope of the trend in the average rates for the population aged 15 and over, shown in table 2.13.

2.23 The main feature of note in this forecast is the strong contrast between the growth of the working population forecast for Teesside and the national forecasts of the Ministry of Labour (see table 2.4).

Table 2.4. Forecast of total and working population, 1966–81

	total population, aged 15 and over		working population	
	England and Wales	Teesside	United Kingdom	Teesside
1966	100	100	100	100
1981	106	126	104	134

Sources: Ministry of Labour *Gazette*, November, 1966, p. 718; Registrar General's *Annual Statistical Review*, 1966.

The situation is that the working population of Teesside is likely to increase at a faster rate than its growth in total population, assuming that the target population is achieved. This is very different from the national situation where not only is the rate of growth in total population much slower than on Teesside but the rate of growth in the working population is less than that for total population. These differential rates are a consequence of the different age structure of the two populations, and assumptions about the regional factor. But the implication is also that family income and prosperity on Teesside should be able to rise at a relatively rapid rate if sufficient jobs can be provided to meet population policy interpreted through the forecast national levels of age-specific rates.

2.24 Forecasts have been made of the likely growth in manufacturing and service employment arising solely from the development of firms already located on Teesside, and from the need for additional employment in services for the increased population of Teesside. This forecast, classified into males and females, is described in chapter 6. This forecast of autonomous growth in employment can be compared with the forecast increase in the supply of labour on Teesside. The comparison, in table 2.5, suggests, first, that the assumption of a rapid rise in female activity rates is likely to be reasonable. Indeed it is conceivable that rates could rise even more rapidly than has been assumed if the employment forecast proves accurate. However, the comparison also shows that the assumed fall in male activity rates will not be sufficient to match the very slow rise in locally generated male employment.

Table 2.5. Forecast of labour supply and employment, Teesside, 1966–91

	male	female
growth in resident working population	+52,800	+42,200
autonomous growth in employment	+19,800	+38,400
deficiency in growth of employment	−33,000	− 3,800

This gap between these two forecasts is a measure of change in the Teesside economy that will have to be accomplished if the population policy is to be achieved. But it is possible that the complexities of the Teesside economy may be such that some of this surplus of male workers may compete successfully for jobs in the female sector, thus depressing female activity rates. Thus, at this stage, the comparison of the forecasts of locally generated employment, and working population can only demonstrate that the assumed activity rates are, probably, reasonable.

The forecast of labour supply

Activity rate definitions

2.25 An activity rate is the percentage of people recorded as employed or unemployed in a specific age-sex group. More precise definitions depend on the exact meaning of 'working population' and 'total population'.

2.26 The Ministry of Labour uses the following definitions:

working population includes persons holding insurance cards (excluding those known not to be at work); seamen holding insurance cards; employers, self-employed, H.M. forces; civil servants; registered unemployed.

total population includes the home population (i.e. residents, at their usual place of residence); H.M. forces overseas, and excludes overseas countries' forces in Great Britain.

2.27 The Census of Population uses the following definition:

economically active population is similar to the working population (Ministry of Labour) but excludes groups omitted from the Census, i.e., students with insurance cards; some seasonal and irregular workers with insurance cards; some married women with insurance cards.

2.28 Both definitions include a proportion of part-time workers. It is a legal requirement that every person working for more than ten hours weekly must hold an insurance card. Practical observance is not necessarily complete. The Census of Population places no limit on the minimum number of hours worked per week for inclusion in its returns.

2.29 Estimates of the working population in Great Britain in 1961 by these two definitions show that the differences are slight (see table 2.6). The comparatively slight difference is confirmed by the data in table 2.7 where estimated five-year age-sex specific activity rates from the two sources are compared. Therefore, the forecasts are made in terms of the 'working population'. This enabled direct use to be made of the national forecasts by the Ministry of Labour of future age-specific activity rates, which are in the same terms. The alternative method would have been to assume that the trends in national rates for the 'economically active population' would be similar to those for the 'working population', a more cumbersome method.

Preparation of forecast of national activity rates

2.30 Table 2.8 contains a forecast of five-year age-sex specific activity rates for Great Britain, using the Ministry of Labour's definition of activity rates. The forecast is based on those for 1971 and 1980 which were published in the Ministry of Labour *Gazette*, January, 1965. Rates for 1961 were estimated from Ministry of Labour data. Rates for intervening years were interpolated. And rates for 1991 were estimated by graphic extrapolation of the Ministry of Labour forecasts, assuming a marked 'ceiling effect' on the rise of female rates. The Ministry of Labour forecasts were supplemented by those listed in the note to table 2.8.

2.31 These national age-sex specific rates were used because at this stage they are the only firm rates available for 1961 and for future forecasts. The marital-specific rates forecast by the Ministry of Labour for females were not used as details of the 1961 situation are not available for Teesside. The only information available from the Census is of the marital status of women aged 15 and over for Middlesbrough C.B. and

Table 2.6. Working and economically active population, Great Britain, 1961

	Ministry of Labour (a)	Census (b)	ratio (a) ÷ (b)
male	16,387,000	16,078,000	1.0193
female	8,277,000	7,740,000	1.0694
married	4,363,000	3,886,000	1.1227
single, widowed and divorced	3,914,000	3,854,000	1.0156

Table 2.7. Activity rates, working and economically active population, 1961 (per cent)

	male		female	
age group	Ministry of Labour rate	Census rate	Ministry of Labour rate	Census rate
15–19	75.5	74.5	74.5	70.4
20–24	98.0	93.5	66.0	62.6
25–29	99.5	98.0	43.5	39.8
30–34	99.5	98.5	40.5	37.1
35–39	99.5	99.0	44.0	43.0
40–44	99.5	98.8	48.5	46.0
45–49	98.5	98.5	49.0	46.0
50–54	95.0	96.0	46.5	43.5
55–59	94.5	97.0	40.0	37.2
60–64	90.0	91.0	20.0	20.5
65–69	44.0	39.5	–	–
70–74	17.0	15.0	–	–
65–74	–	–	8.0	8.0

Sources: Census activity rates for economically active population, England and Wales: estimated from Census of Population, 1961, *Occupation Tables*;
Ministry of Labour activity rates for working population, Great Britain: Ministry of Labour *Gazette*, September, 1962, p. 343

Table 2.8. Forecast of age-sex specific activity rates, Great Britain, 1961–91 (per cent)

age group	male 1961	1966	1971	1976	1981	1986	1991	female 1961	1966	1971	1976	1981	1986	1991
15–19	76.5	66.0	66.0	60.0	54.5	63.0	52.0	74.6	71.5	67.5	60.5	56.0	53.0	50.0
20–24	96.0	94.0	93.0	92.0	86.0	87.0	66.0	66.0	57.0	54.0	63.0	61.5	61.0	60.0
25–29	99.5	99.0	99.0	99.0	99.0	99.0	99.0	43.6	40.0	39.5	39.0	38.5	38.0	38.0
30–34	99.5	99.0	99.0	99.0	99.0	99.0	99.0	40.5	38.0	37.5	37.0	36.5	36.0	36.0
35–39	99.6	99.0	99.0	99.0	99.0	99.0	99.0	44.0	45.0	46.0	47.0	46.0	49.0	50.0
40–44	99.5	99.0	99.0	99.0	99.0	99.0	99.0	46.5	62.0	54.0	56.0	67.5	58.0	58.5
45–49	98.5	96.0	98.0	96.0	98.0	96.0	96.0	49.0	52.5	55.5	56.5	60.5	61.5	62.0
50–54	96.0	96.0	96.0	96.0	96.0	96.0	95.0	46.5	62.5	55.5	56.5	60.5	61.6	62.0
55–59	94.5	94.0	94.0	64.0	94.0	94.0	94.0	40.0	44.0	47.0	50.0	61.5	52.5	63.0
60–64	90.0	90.0	90.0	90.0	90.0	89.0	88.0	22.0	24.0	25.5	26.0	26.5	27.0	27.0
65–69	44.0	39.5	37.5	36.0	34.6	33.5	32.5							
70–74	17.0	16.0	15.0	14.0	13.0	12.0	10.0							
65–74								6.0	6.0	6.5	6.5	6.5	7.0	7.0

Sources: based on Ministry of Labour forecasts of Great Britain activity rates to 1980. Ministry of Labour *Gazette*, January, 1966, W. Beckerman and Associates, *The British Economy to 1975* (Cambridge, 1965), chapter 3; C. D. Buchanan and Partners, *South Hampshire Study* (H.M.S.O., 1966), Supplementary Volume No. 2, p. 64.

Stockton M.B. Data on the marital and age status of female workers were not extracted from the Home Interview Survey. They would not be strictly comparable with national data because of the different definitions of part-time employment, referred to in paragraph 2.16.

Teesside activity rates

2.32 No data are available of the age structure of the current working population of Teesside. The only reliable estimate of its total size is that given by the economically active population in the 1961 Census. The annual returns of the Ministry of Labour suffer from several omissions and cannot be used for this purpose. They exclude employers and self employed, and include workers who do not live on Teesside but travel daily to their work on Teesside.

2.33 Therefore two sets of calculations have to be made using the estimate of the economically active population if forecasts are to be obtained of the working population of Teesside. The first (see table 2.9) is to convert the Census figures of economically active population into an estimate of the working population according to the Ministry of Labour definition. The calculation is for the Teesside Population Area in 1961. The conversion factor for males is assumed to be the same as the ratio between the two estimates for Great Britain given in paragraph 2.29; that for females is based upon the ratios given in paragraph 2.29, but corrected to allow for the smaller proportion of married women in the economically active population of Middlesbrough C.B. and Stockton M.B. at the 1961 Census.

Table 2.9. Working and economically active population, Teesside Population Area, 1961

	economically active population	conversion factor	estimated working population
male	139.730	1.0128	141,519
female	51,340	1.0500	53,907

2.34 The second calculation (given in table 2.10) takes the national age-sex specific activity rates of the working population in 1961 and applies them to the Teesside population of 1961. The working population estimated in this way is then compared with the figures derived from the Census, shown in paragraph 2.33. The comparison shows that the calculation based on national activity rates underestimates the size of the male working population by 3.7 per cent; and over-estimates that of the female working population by 20.7 per cent. These two ratios are described as the 'regional factors' of the Teesside working population; they give a summary indication of the difference between activity rates on Teesside and Great Britain.

Table 2.10. Regional factors, working population, Teesside Population Area, 1961

age group	male population	activity rate (per cent)	working population	female population	activity rate (per cent)	working population
15–19	15,766	75.6	11,903	15,246	74.5	11,363
20–24	13,360	96.0	12,826	14,068	66.0	9,285
25–29	14.832	99.5	14,768	14,165	43.5	6,157
30–34	16,203	99.5	16,122	15,144	40.5	6,133
35–39	16,770	99.5	16,666	16,140	44.0	7,102
40–44	14,966	99.5	14,891	14,256	48.6	6,914
45–49	14,140	98.6	13,928	13,730	49.0	6,728
50–54	13,580	95.0	12.901	13,206	46.6	6,141
55–59	12,030	94.6	11,368	12,220	40.0	4,666
60–64	9,327	90.0	8.394	10,627	22.0	2,338
65–69	6,420	44.0	2,626	–	—	–
70–74	4,527	17.0	769	–	–	–
65–74	–	–	–	15,499	6.0	930

Calculation of regional factors	male	female
(a) estimated working population derived above	137,371	67,969
(b) correct working population from table 2.9	141,519	53,907
(c) difference, (b) — (a)	+5,062	—14,062
(d) regional factor, $\frac{(b)-(a)}{(a)} \times 100$	+3.7 per cent	—20.7 per cent

Forecast of the future working population of Teesside

2.35 The method of forecasting is based on the use of the forecast national age-sex specific activity rates, and an assumption about future Teesside regional factors. The latter assumption is that the regional factors will have declined to zero by 1991 for both males and females. That is, the male activity rates on Teesside will fall to national levels, which themselves are expected to fall; and female activity rates on Teesside will rise to national levels, which are expected themselves to rise. The rate of shift towards national levels of activity rate is assumed to be most rapid during the 1970's, with a slower rate of change in the 1980's (see table 2.11).

Table 2.11. Forecast of regional factors, Teesside, 1961–91 (per cent)

	male 15 and over	female 15 and over
1961	+3.7	−20.7
1966	+2.5	−19.0
1971	+2.0	−18.0
1976	+1.5	− 9.0
1981	+1.0	− 5.0
1991	0	0

2.36 The final forecast of the working population of Teesside, by sex, is therefore made in two stages. First, forecast national rates from table 2.8 are applied to the population forecast, given in chapter 1. Second, the appropriate regional factor, from table 1.24, is applied to this estimate to give a forecast of the working population. The final forecast is given in table 2.12, and the activity rates for males and females aged 15 and over is given in table 2.13.

Table 2.12. Forecast of working population, Teesside, 1961–91

	male 15 and over	female 15 and over	total 15 and over
1961	141,519	53,907	195,426
1966	149,100	60,200	209,300
1971	158,300	67,200	225,500
1976	167,600	76,600	244,200
1981	177,000	84,800	261,800
1991	201,700	102,400	304,100

Table 2.13. General activity rates, Teesside, 1951–91 (per cent)

	male 15 and over	female 15 and over
1951	89.2	28.9
1961	88.9	31.4
1966	88.3	34.2
1971	87.0	38.9
1976	84.7	38.1
1981	83.4	39.3
1991	81.1	41.4

Geographical distribution of the supply of labour

Distribution in 1966

2.37 Data were available from the Home Interview Survey on the resident working population for each fine and coarse zone on Teesside. The fine zone system, 211 in all, was that used mainly for transportation analysis. The fifty-eight coarse zones were aggregations of fine zones, used mainly for land use analysis.

2.38 The problem of using the data directly are described in paragraph 11.3. Instead, therefore, the local activity rate, for males or females, was applied to the estimated total male and female population of the zone, the estimates being those described in chapter 11. The activity rate was the simple ratio of resident working population to total population.

Distribution of working population, 1991

2.39 Fundamentally, the same method was used as for 1966. An activity rate was applied to the total male or female population forecast for that particular zone in chapter 11. A single activity rate was used for the male working population, the ratio between the resident working population of Teesside in 1991 and the total population. Three different rates were used for the female population, depending on the location of the particular zone.

2.40 These assumptions were made after data from the Home Interview Survey had been examined to see whether there was any significant variation in the age structure of the population in different zones, and whether activity rates showed any tendency to vary.

2.41 Only slight variations were found in the proportion of population of working age in different zones. The median proportion for the fifty-eight zones was that 62 per cent of the population was aged between 15 and 65 years (60 for females); but the interquartile range was only 59–62 per cent. A graphical analysis was then made of the age structure of population in each zone. This showed significant variations in the proportions above and below the working age groups, related mainly to the modal age of dwelling and tenancy arrangements. The age group 0–14 is largest in areas of new dwellings and on local authority estates, and smallest in areas of old, private housing. The exact converse is true of the population above working age. In general, therefore, there is this tendency for a relatively constant proportion of working age though with a slight tendency for the proportion to be higher in areas of new housing. It was assumed that this situation would continue.

2.42 Male activity rates showed very little variation in 1966, the only discernible tendency being slightly lower rates in East Cleveland and the rural areas, where employment opportunities are poorer. It will be shown in chapter 7 that employment will in future be more widely dispersed than at present, with a more uniform spread of employment opportunity. It is reasonable therefore to assume a uniform male activity rate in all coarse zones by 1991.

2.43 Analysis of female activity rates showed a wide variation in 1966. The median general activity rate (that is, for the female population aged 15–59 years) for the fifty-eight coarse zones was 30 per cent but the interquartile range lay between 23 and 37 per cent. The explanation of this variation is not simple. There is no very marked tendency for female rates to be lower in zones where the modal age of dwelling is older. Rates tended to be higher in local authority estates though, once again, the relationship is not strong. At the coarse zone level, too, there was very little tendency for activity rate to be related to the number of jobs available in the zone.

2.44 The analysis was then made more rigorous by distinguishing between blue- and white-collar jobs and the comparable social status these jobs imply. The terms are defined in paragraph 4.12. This showed much stronger relationships. Blue-collar activity rates were significantly related to the modal age of dwelling, being highest in areas of older housing. They were significant, too, in zones of local authority housing especially those which also had a high level of job opportunity. White-collar activity rates in general show weaker relationship but there is slight evidence that they tend to be highest in areas of the newest housing, especially on private housing estates. White-collar rates showed virtually no sign of being related to job opportunity.

2.45 It would seem therefore that there are regular patterns in the geographical distribution of female activity rates but that the characteristics of the two classes, blue- and white-collar, tend to cancel each other out. Ideally, therefore separate forecasts should be made of the distribution of population according to social status, and separate activity rates applied. But this was dismissed as no reasonable means could be found, at this stage, for making the forecast.

2.46 Instead, further analysis was made of the 1965 activity rates, this time at the level of the fourteen districts described in chapter 4, a series of aggregations of zones into clearly identifiable areas of Teesside. The availability of jobs was compared with the total female population and the population of working age (see table 2.14). The analysis showed slight signs of a relationship: activity rates were highest where job opportunities were greatest, in the urban centre of Teesside; and were lowest where job opportunities were least, in the rural areas and on the coast. But the relationship was by no means clear. Thus activity rates tended to be low in several areas where female job opportunities were relatively good. This was particularly true of Stockton and Billingham and the more accessible parts of Cleveland on the coast between Redcar and Saltburn and at Guisborough. The opposite was found at Eaglescliffe, Yarm, Nunthorpe and Marton. In each of these areas activity rates tended to be high whereas job opportunities were poor. These are the districts of most recent growth, particularly as private housing estates.

2.47 There are many uncertainties in making assumptions about future local variations in female activity rates. This is particularly so as it has been taken as a statement of policy that the general female activity rate for the population aged over 15 should rise from 34 per cent in 1966 to about 41 per cent by 1991. It seems possible that a consequence of the achievement of this aim would be for the variation in local activity rates to be reduced, as female job opportunities are more widely scattered. It will be shown in chapter 7, however, that there is a limit to the degree to which this dispersal can be expected. It seems probable therefore that local variations will remain.

Table 2.14. Local female activity rates and job opportunities. Teesside, 1966

district	total activity rate (per cent)	job opportunity ratio (jobs per total population)
1. Middlesbrough	24.2	0.29
2. Stockton	22.4	0.26
3. Thornaby	23.7	0.15
sub-total, urban centre	23.6	0.27
4. Billingham	21.9	0.28
5. Eston	23.2	0.17
6. Redcar	20.2	0.16
7. Nunthorpe–Marton	23.3	0.10
8. Eaglescliffe–Yarm	27.6	0.13
sub-total, rest of urban area	22.5	0.19
9. Stillington	23.3	0.15
10. Sedgefield	28.4	0.25
11. Saltburn–Marske	19.8	0.18
12. East Cleveland	21.5	0.13
13. Guisborough	18.9	0.22
14. Stokesley	19.1	0.11
sub-total, periphery	21.2	0.17
TOTAL	23.0	0.24

Note: total activity rate is the percentage of total female population which is at work.

2.48 The following rates have therefore been used to forecast the distribution of the resident working population:

Middlesbrough, district 1:
32.2 per cent of total population
rest of urban area, districts 2–8:
30.0 per cent of total population
rural and coastal areas, districts 9–14:
27.8 per cent of total population

These ratios have been selected to represent the likely variation and, at the same time, to give an estimate of the total working population in accord with the general forecast in table 2.12.

3 The Teesside economy

Economy and urban structure

3.1 The economy of Teesside is one of the major factors influencing the development of a coherent urban structure policy and, in its turn, the urban structure at any one time may have repercussions on the economic strength of the area. There are several ways of measuring an area's economic development. In practical terms, however, the most readily available measure for systematic analysis is the total level of employment in Teesside, a simple if necessarily crude index of the sub-regional economy. In examining its geographical distribution, it is possible to observe the interaction of the economy and urban structure. By using employment as the final measure of spatial distribution of the economy, it is put in terms that are easily comparable with other features of the urban structure, such as housing, and in particular in terms that can be used directly in the analysis of person-movement within Teesside.

3.2 The biggest question needing to be answered when planning an area like Teesside is that concerned with the size and character of its future population. A forecast of this future population has to be made, but there are alternative approaches. An entirely passive approach would be to predict the probable future level of population solely from an examination of past trends in population, that is from an examination of past trends in fertility, mortality and migration; and to make provision in the urban structure policy to satisfy the probable needs of these people.

3.3 This passive approach involves complex technical questions, as was noted in the demographic analysis given in chapter 1. But an active population policy involves greater tasks. It has all the technical difficulties of the passive forecast but to them is added the need to identify the forces that influence the real growth of population in an area and if necessary to act upon the results of the analysis so as to encourage growth towards a future target population.

3.4 The population forecast in chapter 1 fundamentally implies an active policy. The brief analysis of trends in immigration, and the more detailed analysis of Teesside's economy in the following chapters, show that there can be no expectation of future inward immigration of population to Teesside unless positive action is taken to encourage this. The power of inducing growth in employment in manufacturing industry in development areas, of which Teesside is one, rests in part with the Government. Thus an indication of the prospects for future growth in employment is given initially in statements of Government policy and in the reports of bodies such as the Northern Economic Planning Council. The Council's policy was set out in *Challenge of the Changing North* and, as was noted in chapter 2, Volume I, the Government has accepted the major conclusions of that report regarding the desirability of future growth in employment in the North East and on Teesside.

3.5 A further, tentative justification for this positive policy will be demonstrated by the analysis and forward projection of Teesside's economy, showing that its character is likely to be more stable and prosperous if inward immigration is encouraged than if population were allowed to decline. Its employment opportunities would be more varied, particularly for women, and family incomes would be higher. This latter fact would lead to a greater demand for shops and services which, in turn, would create still more jobs.

3.6 The forecast given in chapter 2 of the numbers of people likely to be seeking work, assuming that population does grow by inward immigration, has other features of an active policy. It states, as a goal, that activity rates should change in the direction of greater conformity with future national levels. In other words, opportunities for women to work should be increased; and, as opportunities for further education expand, some lowering of activity rates amongst young people should be expected.

3.7 Both of these active policies, to be successful, carry profound implications for the economy, environment and urban structure of Teesside. For the economy, somehow, through the independent decisions of industrialists, encouragement by the local authority, trade associations and Government policy, enough jobs must be created to meet the demands of the population. This means using Government powers to attract industrial development. But for the longer term it means creating an economic structure which will provide more jobs through its own momentum. It means creating an infrastructure of roads and services to Teesside and within Teesside that will make possible the rapid and convenient movement of people and goods. It means creating an attractive environment offering opportunities for education and recreation, for social, commercial and cultural activities.

3.8 But the first requirement is for a clear understanding of the economy of Teesside, both spatially and structurally, so that best estimates can be made of the future level of employment, as this will be the major determinant of population growth on Teesside. For this reason, the underlying philosophy of these employment forecasts must be understood. It is clearly impossible to make reliable forecasts of employment for a period of twenty-five years with any degree of accuracy. For reasons that will become apparent in later chapters, the industrial structure of Teesside does lend itself more readily to long term forecasting than that of more diversified areas. Nevertheless, even on Teesside, all that can reasonably be made is a range of predictions showing the possible variation in the future levels of employment under the foreseeable circumstances at the time of making the forecast. This was done, for instance, in forecasting the future population growth by natural increase on Teesside.

3.9 However, contemporary techniques of land use and transportation planning, in particular the use of mathematical models to simulate future traffic flows, are such that their full utility can be gained at reasonable cost only on the assumption of a single forecast of the total level of population and employment, irrespective of the degree of accuracy of that forecast, and the techniques can allow for very minor variations in the geographical distribution of population and employment. The only exception to this was the procedure used to compare seven alternative strategies for the future development of Teesside, described in chapter 5, Volume I. But this was carried out by varying the distribution of population and employment in each strategy only in the most generalised of ways.

3.10 The guiding principle in making the single forecast of the total level and distribution of employment has been at all times to ask the question, what is the lowest level of future employment, say, that can be relied upon as being virtually certain; and, as a consequence, what is the most that has to be done in the way of creating new jobs if the aims of an active population policy are to be achieved.

3.11 In more concrete terms, the active population policy, and the goal of changing the local activity rates, means that about 316,000 jobs will be needed on Teesside by 1991. But the future level of employment that can be confidently expected from the continued activities of industries already on Teesside, and from a conservative estimate of the employment in shops, professions and other services for the population forecast for 1991 is about 255,000 jobs. In a sense, therefore, there could be by that time a 'manpower gap' of about 61,000 jobs that would have to be filled by new activities if the population target were to be achieved.

3.12 But the prediction of 316,000 workers is a high forecast; it assumes that the goals of population policy have been achieved, and it is probably high in the technical sense that it assumes a relatively rapid rate of natural increase. The prediction of 255,000 jobs is, if anything, an underestimate as it assumes rapid increases in productivity at the same time as a relatively slow long term rate of increase in family incomes. Thus the employment gap of 61,000 is a relatively high measure of the need for new jobs, deliberately so in order that full and adequate measures can be taken to attract new jobs to Teesside.

3.13 The complexity of this task of analysing and predicting the future course of the Teesside economy is sufficient justification for devoting four chapters to the subject.

a Chapter 4 sets out the basic facts of employment on Teesside in 1965, the sources of data, the methods of measurement and the systems of classification. It concludes with a brief account of recent trends.

b Chapter 5 takes the economy and examines its trading basis on the strength of which certain characteristic features of the different industrial sectors are identified. These, in turn, lead into a thorough account of the geographic pattern of industry within Teesside, its resources and its locational preferences.

c Chapter 6 is a more straightforward account of the forecasts of the autonomous growth in employment in each industry and service on Teesside, that is the future employment to be expected from existing activities and the provision of services. The 'manpower gap' is identified and a brief analysis of development area policy in North East England demonstrates some of the implications of filling this gap.

d Chapter 7 is an equally straightforward analysis and forecast of the geographical distribution of jobs on Teesside, with a detailed account of a method of forecasting future employment on industrial estates and the selection of future sites for estates on Teesside.

The remainder of chapter 3 is devoted to some general observations on the economy of Teesside and an evaluation of the results of the forecasts.

The changing economy

3.14 The economy of Teesside in 1966 was of a highly specialised and distinctive character. Its very existence arises from two industries, steel and chemicals, both of which are well established in the area but both of which are undergoing great changes as they modernise and expand in response to world conditions and markets. The area's second most striking characteristic is the relative absence of jobs for women, mainly because the two basic industries, to which should be added the third largest, heavy engineering and shipbuilding, are male employing industries.

3.15 But this economy is continually changing. One reason for this is the various forms of technological change, usually affecting one industry more than another, impinging on productivity and prices and, indirectly, on employment. The impact of technological change will almost certainly be felt most strongly in the steel and chemical industries. Economies of scale in production and the growing sizes of markets are making necessary rapidly rising ratios of capital to labour, which already are high in these industries. Output from these industries on Teesside could, and probably will continue to expand but the number of jobs is likely, at best, to remain constant and will more probably fall.

3.16 But this, and other technological changes, and the implied growth of productivity means that it is reasonable to expect average personal incomes to rise faster than any increase in prices. This, obviously, is a statement about long-term trends over a period of twenty-five years, a period into the future very nearly as distant as the 1930's with all that the comparison implies for a rising standard of living. If personal incomes rise in this way, as forecast in chapter 13, peoples' patterns of expenditure will change: a great proportion of income will be spent on durable goods such as motor cars and refrigerators and less on food; and more will be spent on leisure and recreation.

3.17 A second cause of future change in the economy would be the achievement of a positive population policy as this depends in part on an appropriate expansion in the number of jobs on Teesside. But the people living on Teesside, whether or not they have immigrated into the area, will themselves create certain jobs. They will need houses, which will be built with largely local labour. Unless they radically alter their patterns of behaviour, they will need more shops, schools, services of every kind, which also will mean more local jobs. In all, the simple growth of population would itself create about half of the additional jobs needed to sustain the forecast level of population.

3.18 The change in the probable pattern of spending means that the pattern of employment in the services noted previously will also change with, say, relatively more workers employed in road haulage and perhaps fewer still in rail transport. But there are some goods, including durable goods and cars, where the level of spending depends more on household income than on the wages or salary of an individual. Thus, the aim and expectation of a rising female activity rate will reinforce the trend towards higher family incomes and the associated changes in spending patterns.

3.19 A third important force affecting Teesside's economy is the effect of its dependence on other areas and other countries. Teesside is part of the national and the world economy. It may be affected by events in the Midlands or in Australia. Therefore some study of this dependence is necessary for a better understanding of Teesside's problems and prospects. But it is necessary also so that a major issue of policy can be isolated: to what extent is this dependence capable of being changed?

3.20 Almost half of the people employed on Teesside work in service industries which are almost exclusively concerned with satisfying the wants of people who live in the area, and seven out of every eight men or women working in manufacturing industry in Teesside are producing goods which are exported directly from the region, partly to other parts of Britain, partly overseas. But the two basic industries export almost all their products, a relatively high proportion going overseas, as shown in chapter 5. Thus, Teesside is peculiarly dependent on happenings in other countries and other regions. The extent of this dependence is such that any overall reduction in the sales of Teesside industries to other countries and regions would lead directly to a substantial fall in their employment, let alone the additional unemployment caused by the lesser demand for local services.

3.21 The significance of this is that the overseas markets for the basic industries are continually changing, as is shown in chapter 5, and the sales of engineering and shipbuilding products also depend on a small number of relatively large contracts. Partly as a consequence of this, partly because it specialises in manufacturing goods for supply to other industries rather than for domestic consumption, the Teesside economy has been liable to fluctuating levels of employment and unemployment. This cyclical variation in the basic industries has been considerable in the years since 1954 (see chapter 4) although its full effects have been masked by another phenomenon. In general, these have been years of relatively full employment in which manufacturing and service industries have been competing for labour. Thus, when employment in basic manufacturing has fallen, that in service industry has risen.

3.22 But this scale of compensating expansion of employment in services is likely to be a relatively short term phenomenon. In the long term, service employment on Teesside will rise only if sufficient income is generated by employment in manufacturing, and this will expand only by increasing sales to other areas and countries. Thus a more resilient economy for Teesside will be one in which there is a steady growth in sales and employment in manufacturing, which means an industry less dependent on relatively few products and markets. This is particularly so in view of the technological changes in steel and chemicals which indicate a falling level of employment although output continues to rise.

3.23 This desire for a more resilient economy, less liable to cyclical fluctuations, is one reason for seeking a more diversified industrial structure for Teesside. But there are additional, supporting reasons. Further exploitation of the area's remaining mineral resources is unlikely to make for any change in industrial structure. Neither the potash nor the natural gas discoveries in the North York Moors is likely to create large numbers of new jobs on Teesside, and the other remaining natural resources, estuarine land, navigable river and water supply, will mainly be used in the further expansion of output in the steel and chemical industries.

3.24 A final, subsidiary benefit is that the new manufacturing industries providing diversification will be labour intensive, of the type usually sited on industrial estates. The locational requirements of these industries are not very stringent, being only good access to the national road system and to regional supplies of labour. Thus the location of these estates may be chosen in relation to the distribution of population, making possible a wider dispersal of employment than in the existing economy which is more dependent on close proximity to the river Tees.

Implications of the changing economic structure

3.25 The economic structure of Teesside can therefore be expected to change considerably during the next twenty-five years. The changes will be partly as a consequence of factors such as technological change and movements in world markets and the national economy, forces beyond the control of a planning policy for Teesside. But the changes will also partly be a consequence of a regional and local planning policy aimed at raising the level of population on Teesside by attracting inward immigration, and at raising female activity rates by ensuring more job opportunities for women. The full extent of this possible change in the economy is roughly illustrated in table 3.1.

Table 3.1. Changing employment structure, Teesside, 1966–91 (per cent)

	1966	1991
chemicals, steel, heavy engineering, shipbuilding	40	22
other manufactures	9	25
services	51	53
male	72	68
female	28	32
blue collar	64	52
white collar	36	48
TOTAL	100	100

Notes terms are defined in chapter 4.
services includes the very small amount of employment in agriculture and extractive industry

3.26 The remaining questions to consider are whether a structural change of this magnitude is feasible and whether it is worth achieving. Neither can be answered conclusively but there are factors which aid in an assessment.

3.27 The feasibility of this change depends fundamentally on whether between 50,000 and 60,000 jobs can be created in light manufacturing firms new to the area. This is considered in some detail in chapter 8 by an analysis of past trends in creating similar new jobs on Teesside. Briefly, the required rate of about 2,000 new jobs a year is about twice the average rate over the last few years, since the passing of the Local Employment Act, 1960. Its achievement would mean that there must have been an acceleration in the creation of new jobs in the Northern Region as a whole with Teesside continuing to get its share of about 15 per cent, that is roughly equal to its share of the Region's population. Alternatively, Teesside must have become a favoured area, receiving more than its *per capita* share of new jobs.

3.28 The light manufacturing sector of industry, more than any other, is controlled in its choice of location by Government policy, through the grant of Industrial Development Certificates, by investment allowances and by other financial incentives. Whether growth on the envisaged scale is feasible depends largely on Government policies of this kind. But this is not all. The area must have good internal transport links and good communications with its markets, particularly those in the North West, the Midlands and the South East. Specifically, this means improvements in the road links with the A1 trunk road, particularly via the A19. Further, the housing and environment of the area must be made more attractive. In all these fields the opportunity is open for Government action to lay the groundwork for achieving a changed economic structure. A creative attitude towards these matters could eventually make active control of the location of industry less necessary.

3.29 The desirability of achieving a change in Teesside's economy derives mainly from the fact that it will then probably be subject to less violent short term fluctuations in the level of employment. The composition of the industrial make up will be to include a higher proportion of service trades, which do not fluctuate as much as manufacturing, and, within manufacturing, there will be less dependence on three basic industries which supply a significant proportion of semi-manufactured products to overseas markets as well as to home markets. Examination of the distribution of those overseas markets, in chapter 5, shows that import substitution of products such as fertiliser could effect the growth of chemical production just as new steel making capacity by overseas countries has deeply affected the British steel industry.

3.30 But the changed structure would also give a wider choice of economic opportunity, by creating more jobs for women and for white-collar workers. Both of these are national as well as local Teesside trends: but their net effect is likely to be reflected in higher family incomes and a rising standard of living. The changing locational requirements of the industries will make possible a wider dispersal of employment, which also will expand the effective choice of jobs available to people from their homes.

3.31 In these respects, therefore, the attempt to guide changes to the economy of Teesside will be a necessary part of urban structure and population policy and will be a desirable aim in itself. Its practicality depends more strongly on the acceptance of this aim by Government, and the development of an urban structure for Teesside that will meet the requirements of the new industrialists and their workers.

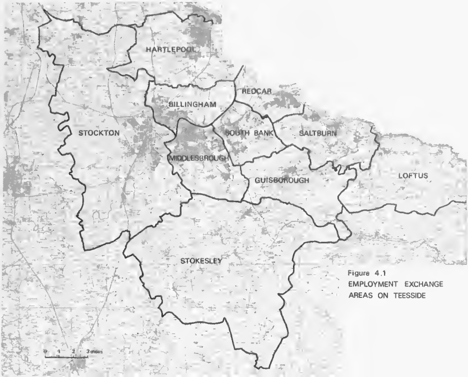


Figure 4.1
EMPLOYMENT EXCHANGE
AREAS ON TEESSIDE

4 Employment, 1954–66

4.1 The analysis of the Teesside economy made in this and the next three chapters of this report is carried out mainly in terms of employment statistics. Several sources of data were used in the analysis and it is very important to understand their precise nature in order that a firm description can be given of the existing employment situation on Teesside and a basis found for forecasting future changes in employment. This chapter therefore contains a brief description of the data and an account of the measurement of the current size and distribution of employment on Teesside. It concludes with an account of recent changes in the employment structure of Teesside.

Sources of employment data

4.2 Unpublished data from the Ministry of Labour provides the main source of official statistics about employment. The data take the form of an annual return of the number of insured workers whose insurance cards were counted at a particular employment exchange during the June exchange of cards. The return, which is made on form E.R.II, includes registered unemployed, and employees whose normal place of work is in the local exchange area. The Ministry of Labour makes adjustments for workers employed in the area whose cards are exchanged elsewhere but four main types of worker are excluded from the return: self-employed; part-time workers who have no insurance card, in general those who work less than ten hours weekly; established civil servants; seamen on foreign-going vessels.

4.3 The data are classified by sex and by industry, though not by the occupation actually performed; thus for instance office workers in offices in the steel industry are classified as part of the steel industry. The classification comprises 153 Minimum List Headings, aggregated into twenty-four classes of the Standard Industrial Classification, 1958. The previous classification (that of 1948) also comprised twenty-four classes, aggregated from 167 Minimum List Headings. Very few of the classes are strictly comparable before and after the 1958 re-classification, but the great majority of Minimum List Headings can be compared in the two systems though in some cases it is necessary to group several headings.

4.4 A separate return is available for each of the eight local employment exchanges (formerly nine) which approximately cover the Teesside Survey Area (see figure 4.1). Returns from the exchange at Sedgefield were combined with those from Stockton after 1958. The difference between the Survey Area and that covered by the eight exchanges was proved to be so slight that it has been ignored in the analysis.

4.5 The second main source of data is the special surveys carried out by Teesside Survey and Plan. Three surveys were concerned specifically with employment.

Employment Survey, E.S.1. This was a full survey of all non-residential property on Teesside and of hotels, hospitals and institutions. A separate, postal questionnaire was sent to each establishment on Teesside rate valuation lists, checked by lists of establishments supplied by the Ministry of Labour. The main data included the products or activities of the establishment, for classification by Minimum List Heading; male and total employment classified by status. The response to this survey covered about 88 per cent of total employment on Teesside, though it was unevenly distributed between different types and size of establishment.

Manufacturing Survey, E.S.2. A survey of the 250 manufacturing establishments at which more than ten workers were employed. The six-page questionnaire and interview covered production and employment; details of the site, services and facilities; transport and trade, including sources of supply, markets and mode of transport; expansion prospects and current problems; and recent movements by firms established at their present premises since 1950.

Warehousing Survey, E.S.3. The twenty-five largest establishments in warehousing, wholesaling and storage (Minimum List Headings 810, 831 and 832) were surveyed in similar, though simpler manner compared with form E.S.2.

4.6 In addition, data about employment, trade flows and business premises were collected in the course of other surveys:

Land Use Survey. A record of land use classified in terms of Minimum List Headings;

Goods Vehicle Survey. Includes a record of trips made and goods carried;

Cordon Survey. An origin and destination survey of vehicles crossing the boundary of the Survey Area;

Home Interview Survey. A sample survey of households including data on person's occupation; the Minimum List Heading of the industry in which they work; numbers of hours worked per week; and trips made, classified by purpose and mode.

4.7 These surveys are more fully described in chapter 25. They were carried out between October 1965 and March 1966. Data were classified geographically by the system of 211 fine zones within the Survey Area and eighteen external zones lying beyond the boundary. These are described in chapter 25. For the purposes of analysis two simplifications of this system were used.

The coarse zone system; this was a system of fifty-eight zones for 1965, made up by aggregating groups of fine zones. A slightly different system had to be used

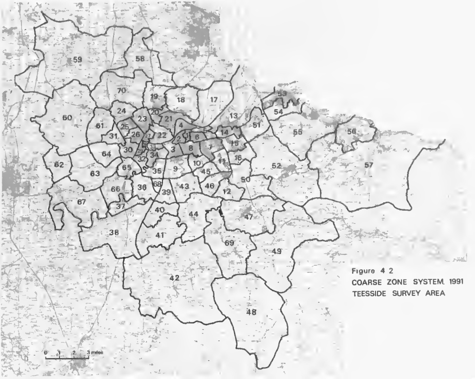


Figure 4 2
COARSE ZONE SYSTEM 1991
TEESSIDE SURVEY AREA

for a valid description of the recommended urban structure for 1991; this seventy-zone system is shown in figure 4.2, and is that used for comparing data for 1965 and 1991 in this report.

The districts; this was a simplified system of fourteen larger districts, coinciding with recognisable units of Teesside, many of them corresponding roughly with the local government boundaries prior to 1st April 1968 (see figure 4.3); they are made up of groups of coarse zones in the 1991 system.

4.8 The third main source of data was reports and official publications. These are referred to in the body of the text.

Classification of employment

4.9 The twenty-four classes of the 1958 Standard Industrial Classification were not found suitable for the analysis of the Teesside economy for the following reasons:

a local returns for individual exchanges have not been corrected retrospectively to make comparable data from before the 1958 change in classification;

b the classes do not clearly demonstrate the particular characteristics of the Teesside economy; a large proportion of Teesside's manufacturing employment is concentrated in a very few Minimum List Headings whose economic groupings cut across the boundaries of the twenty-four classes;

c the most useful classification of employment for land use and transportation planning at the urban structure level has to be simpler than the classes

4.10 A ninefold system of Teesplan Industrial Groups (TIG's) has been devised, as follows:

1 Chemicals;
2 Metals, mainly the iron and steel industry;
3 Engineering, mainly industrial plant design and manufacture and steelwork fabrication, and shipbuilding;
4 Other Manufactures, the remaining employment in manufacturing industry, a mixed group of relatively small industries;
5 Retailing;
6 Central Services, mainly finance, professions and administration, hotels and catering, activities which are usually found in central areas;
7 Non-personal Services, including utilities, transport, warehousing, wholesale distribution, garages; they are activities usually located in proximity to main communications, industry or the fringes of central areas, construction has been included in this group;
8 Health and Education;
9 Agriculture and Extractive, including mining.

4.11 A secondary classification of employment was made by subdividing the nine groups into forty-one sub-groups. Each of these sub-groups is made up by an aggregation of Minimum List Headings. The full classification is given in table 4.1 in terms of the 1948 and 1958 editions of the Standard Industrial Classification.

4.12 Finally, an attempt was made at classifying employment according to two status groups, 'white-collar' and 'blue-collar'. The basic classification was taken from the Home Interview Survey, as follows:

white-collar jobs: professional, managerial and clerical
(Home Interview Survey occupation
codes 01–05, 11, 12);

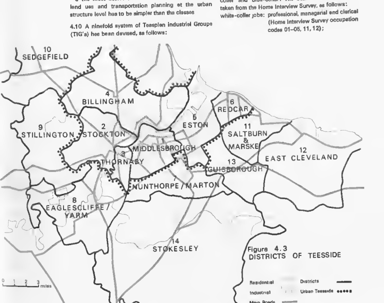


Figure 4.3
DISTRICTS OF TEESSIDE

Table 4.1. Teesplan Industrial Groups, definitions

Teesplan Industrial Group (TIG) main division	subdivision	Standard Industrial Classification Minimum List Headings 1948 Edition	1958 Edition	insured employment June 1966
1. Chemicals	01 basic chemicals, plastics	31 33	271 273 275	28,498
	02 coke ovens, oil refining	30 32 34–6 39	261–3 272 274–6 277	1,243
	03 man made fibres	113	411	3,330
2. Metals	11 iron and steel	40–1 343 43–4	311–2	27,182
	12 iron foundries	42	313	3,643
	13 brass foundries	49 95	321–2	228
3. Engineering and shipbuilding	21 shipbuilding and repairs	50–1	370 1–2	4,080
	22 industrial plant and steelwork	53 57–8 69	336–9 341–2 349	12,058
	23 other mechanical engineering	52 54–6 100–1	331–5 351–2	97
4. Other manufactures	31 baking	151	212	1,988
	32 wire manufactures	93	394	600
	33 miscellaneous metal goods	92 94 98	395 399	1,167
	34 outerwear	140	441–3	2,621
	35 light clothing	141–2	444–5	680
	36 building materials	20 24 28	461 464 469	2,335
	37 timber, woodwork	170	471	1,206
	38 printing, publishing	166 188	486 489	1,086
	39 telephone apparatus	72	363	1,133
	40 woollens, knitwear	122 118	414 417	1,430
	41 miscellaneous manufactures	21–3 70–1 73–5 78–80 82–6 89–91 102–3 110–1 114–7 118–23 129–32 143 147–8 150 152–7 162–3 168–9 171–3 179–83 190–4 199	211 213–9 229 231 236–40 361–2 364–5 369 381–5 389 391–3 396 412–3 415–6 418–9 421–3 429 431–3 446 449–50 462–3 472–5 479 481–3 491–6 499	3,308
5. Retailing	51 retail distribution	243 245–6	820	18,241
6. Other central services	61 finance, insurance	250	860	2,258
	62 public administration	260 266	901 906	8,382
	63 law, accountancy, etc.	270 272 278	871 873 879	1,320
	64 recreation and catering	195 280–3 285	881–4	5,819
	65 miscellaneous services	286 298	889 899	1,841

Table 4.1. Teesplan Industrial Groups, definitions—cont.

Teesplan Industrial Group (TIG) main division	subdivision	Standard Industrial Classification Minimum List Headings 1948 Edition	1958 Edition	insured employment June 1965
7. Non-personal services				
	71 construction	200–2	500	16,681
	72 utilities	210–2	601–3	3,296
	73 railways	220	701	2,515
	74 road transport	221–3	702–3	4,382
	75 post and other transport	227–8 238–9	706–7 709	882
	76 sea transport	224–6	704–5	2,399
	77 wholesale distribution	184 240–2 244	810 831–2	3,531
	78 laundries, garages	81 149 238–7	885–8	3,332
8. Health and education				
	81 education	271	872	9,208
	82 medical services, religion	273–4	874–5	5,871
	83 domestic service	290–1	891	827
9. Agriculture and extractive				
	91 agriculture, forestry, fishing	1–3	001–3	1,450
	92 coalmining	10	101	1,409
	93 other mining, quarrying	11–4 19	102–3 109	78
	99 others	300	XS	237
TOTAL				190,365

Source of employment data: Ministry of Labour returns, Teesside Employment Area

Note: the entries in the columns for the 1948 and 1958 editions of the Standard Industrial Classification are grouped for convenience and do not correspond with each other.

blue-collar jobs: manual, industrial and personal service (Home Interview Survey occupation codes 06–10, 13).

4.13 The Home Interview Survey definition had to be used as the data were required mainly for the purposes of transportation analysis in which employment characteristics would be compared with population and household characteristics. Nevertheless, the use of this definition led to serious problems. First, it meant that comparisons with data from the Employment Survey were made difficult. Even though the definitions were approximately similar in the two surveys, the actual classification in the Employment Survey was necessarily a simple one made by the employer and, in the event, substantial differences arose in the classification of certain jobs in service employment. Second, the Home Interview Survey definition was different from that used by the Ministry of Labour, so national comparisons were made difficult in certain industries.

Size and distribution of employment, September 1965

4.14 It is essential that a reasonably accurate calculation be made of the total level of employment on Teesside to provide a basis for forecasting future changes in employment. It is equally important that the distribution of employment in the fine zone system be estimated for the purposes of transportation analysis. There are fundamental weaknesses in both the main sources of data that prevent their being used in a straightforward manner. The Ministry of Labour data need adjustment to allow for self-employed workers and the other excluded categories of employment, and are available only for comparatively large areas. The main purpose of the Employment Survey was to give a precise indication of the geographical distribution of employment by fine zone, but the response to the questionnaire was incomplete.

Total employment, September 1965

4.15 A set of adjustments thus has to be made to data from the two main sources to give an estimate of total employment. The calculation is summarised in table 4.2. It assumes that the Ministry of Labour data, which includes registered unemployed, was accurate except for the exclusion of self-employed workers and civil servants. The returns for June 1965 and June 1966 are given in table 4.3. Estimates of the registered unemployed in each industrial group were deducted from the total to give the numbers actually employed in June 1965.

4.16 The remaining adjustments in the calculation were as follows, the results of the Employment Survey being summarised in table 4.4.

Table 4.2. Summary estimate of total employment, Teesside, 1966

	male	female	total
insured employment, June 1965 (a)	135,120	55,240	190,360
add, adjustment for self-employed, etc.	9,500	1,620	11,120
subtract, registered unemployment	2,840	1,160	4,000
total employment at work, June 1965	141,790	55,700	197,490
approximate employment, September 1965 (b)	128,150	48,040	174,190
add, adjustment for non-response	13,630	9,650	23,290
total employment at work, September 1966	141,790	55,700	197,490

Sources: (a) Ministry of Labour data, form E.R II;
(b) Employment Survey, form E S.1.

Note. figures are rounded to nearest ten.

Table 4.3. Insured employment, Teesside Employment Area, June 1965 and 1966

Teesplan Industrial Group	June 1965			June 1966		
	male	female	total	male	female	total
1. Chemicals	29,816	3,256	33,072	31,241	3,411	34,652
2. Metals	29,498	1,533	31,031	27,988	1,582	29,570
3. Engineering and shipbuilding	14,717	3,528	18,245	14,697	1,484	16,181
4. Other manufactures	8,515	9,242	17,757	8,485	10,161	18,646
5. Retailing	4,254	11,987	16,241	4,486	12,407	16,893
6. Central services	9,186	9,434	18,620	9,578	10,026	19,604
7. Non-personal services	32,185	5,133	37,318	37,279	5,279	42,558
8. Health and education	4,126	12,780	16,906	4,352	13,695	18,047
9. Agriculture and extractive	2,707	230	2,937	2,660	224	2,884
unclassified	140	98	238	293	146	439
TOTAL	135,124	55,241	190,365	141,039	58,435	199,474

Source: Ministry of Labour returns for employment exchanges, form E.R.II;
Note: figures include registered unemployed and insured employees working for more than ten hours weekly; exclude self-employed, established civil servants and uninsured.

Table 4.4. Results of Employment Survey, Teesside, September 1965

Teesplan Industrial Group	male	female	total
1. Chemicals	30,944	3,403	34,347
2. Metals	30,480	1,172	31,652
3. Engineering and shipbuilding	13,411	1,528	14,939
4. Other manufactures	6,939	8,152	15,091
5. Retailing	5,237	11,080	16,317
6. Central services	7,878	7,925	15,803
7. Non-personal services	26,252	4,020	30,272
8. Health and education	4,095	8,640	12,735
9. Agriculture and extractive	2,915	123	3,038
TOTAL	128,152	46,043	174,195

Source: Employment Survey, form E.S.1., incomplete return.

a The response by manufacturing firms (TIG's 1–4) to the Employment Survey was nearly complete and analysis of the data showed that the numbers of self-employed were so small that they could be ignored; thus the Ministry of Labour data were accepted as correct, showing that a small addition of about 600 workers would have to be made to the Employment Survey data to correct for non-response; there were, however, slight differences in the classification of individual sections of a factory in the two sets of data.

b Most of the corrections for non-response in the Employment Survey and the entire adjustment for excluded categories in the Ministry of Labour data therefore has to be made in the services sector and agriculture. The method was to assume that the Ministry of Labour was correct for the categories included in the data, and to add an estimate of self-employed taken from an analysis of the ratios between self-employed and employees in each industrial group and each sex according to the Employment Survey. The adjustment was greatest in retailing and agriculture where between 25 and 30 per cent of total employment in the group were self-employed and of some size (12 per cent) in the professions, finance and administration.

4.17 The final estimate of employment in the summer of 1965 is given in table 4.5. It shows that an adjustment of about 5.5 per cent had to be made to the Ministry of Labour data, and one of 11.6 per cent to the Employment Survey data for a reasonably accurate estimate of total employment. It was assumed for this analysis that there was no change in employment between June and September 1965.

Table 4.5. Estimated total employment, Teesside, September 1965

Teesplan Industrial Group	male	female	total
1. Chemicals	29,816	3,256	33,072
2. Metals	29,100	1,455	30,555
3. Engineering and shipbuilding	14,525	1,220	15,745
4. Other manufactures	8,837	8,420	17,257
5. Retailing	8,222	13,378	21,600
6. Central services	10,953	9,937	20,890
7. Non-personal services	32,190	5,234	37,424
8. Health and education	4,109	12,677	16,786
9. Agriculture and extractive	4,034	123	4,157
TOTAL	141,786	55,700	197,486

Note: figures include all people in full and part-time employment for more than ten hours weekly;
the figures for TIG's 1–4 in this table differ slightly from those used for the zonal distribution of employment in table 4.7, though the sub-total for the four groups is the same;
the figures actually used in table 4.7 are TIG's 1–3, as in table 4.4

TIG 4,	male	7,443
	female	8,248
	total	15,691

Distribution of employment, September 1965

4.18 The distribution of employment between the 211 fine zones was made by amending the Employment Survey data to allow for the non-response. As the non-response was unevenly distributed both geographically and by industrial group, it was not possible to consider using a simple expansion factor or ratio method of adjustment. Instead, the Employment Survey data were compared with the Ministry of Labour return for each of the eight individual employment exchanges and adjustments made in the light of additional evidence from the Land Use Survey, Ministry of Labour lists of establishments and the Classified Telephone Directory. The calculation was made in terms of the more detailed forty-one Teesplan industrial subgroups.

4.19 A summary of the distribution of employment in the summer of 1965 by the 1991 coarse zone system is given in table 4.6; and the structure of employment in each of the fourteen districts is given in table 4.7. For convenience and purposes of comparison, the final forecast of employment in 1991 is also given in each table though the account of the forecast is not given until chapter 7.

Table 4.6. Distribution of employment, Teesside, 1965–91

coarse zone (1991 system)	September 1965			forecast, 1991		
	male	female	total	male	female	total
1	7,820	7,520	15 430	13 990	14,880	28,840
2	2,300	1,950	4,240	3,280	1,750	5,030
3	670	1,100	1,770	930	830	1,760
4	7,200	1,300	8,500	3,960	1,160	6,130
5	4,060	2,890	6,950	3,380	3,650	7,030
6	4,940	3,940	8,880	3,060	3,060	6,120
7	490	1,380	1,870	840	660	1,630
8	1,660	2,500	4,160	2,470	3,880	6,350
9	640	490	1,130	730	890	1,620
10	250	490	740	880	1,140	2,020
11	810	190	1,000	570	600	1,170
12	70	180	270	3,590	1,090	4,680
13	21,880	930	22,810	22,120	1,950	24,070
14	1,470	1,490	2,960	1.770	1,110	2,570
15	290	330	620	1,240	1,780	3,020
16	170	70	230	260	380	650
17	530	30	560	6,950	380	7,330
18	400	180	580	6,130	610	6,750
19	1,210	1,600	2,820	5,090	3,480	8 570
20	460	570	1,030	470	440	910
21	21,890	2,400	24,280	13,300	3,300	16,600
22	4,740	1,460	6,160	4,200	1,690	5,890
23	920	830	1,750	1,000	820	1,820
24	220	80	300	330	260	600
25	280	280	560	810	1,460	2,270
26	660	680	1,340	1,110	630	1,730
27	3,040	1,250	4,280	2,550	1,520	4,080
28	2,860	3,630	8,510	6 080	6,630	12,710
29	1,390	1,180	2,580	1,080	780	1,860
30	760	660	1,430	730	590	1,320
31	60	120	180	180	170	360
32	4,290	830	5,120	7,840	1,650	9,590
33	6,090	1,070	8,160	4,890	1,100	5,990
34	1,130	650	1,780	1,180	480	1,660
35	630	140	770	3,760	3,020	6,780
36	50	20	70	2,420	1,580	4,000
37	630	260	870	1,700	1,980	3,680
38	390	70	370	7,410	2,160	9,600
39 & 43	310	290	600	6,660	3,730	10,390
40	40	10	50	20	0	20
41	60	10	50	80	30	100
42	250	70	320	330	150	480
44	120	10	130	50	20	70
45	150	130	280	610	490	1,100
46	250	70	330	1,620	1,020	2,630
47	300	250	540	530	250	780
48	50	10	60	50	10	60
49	90	10	100	80	30	110
50	140	40	180	860	450	1,310
51	16,940	1,030	17,960	14,180	1,740	15,920
52	1,600	1,280	2,880	1,910	1,990	3,900
53	2,660	2,840	5,500	5,740	4,410	10,150
54	460	220	680	1,090	1,980	3,070
55	1,260	1,300	2,560	4,280	2,010	6,290
56	250	250	500	390	730	1,120
57	3,610	1,210	4,820	5,350	1,780	7,130
58	50	0	50	40	10	50
59	2,830	1,170	4,010	2,380	1,790	4,170
60	800	160	960	700	190	890
61	100	20	120	110	70	180
62	40	10	40	50	20	70
63	200	30	230	70	40	110
64	60	20	80	140	110	240
65	190	40	230	610	160	760
66	1,600	320	1,820	9,690	1,500	11,180
67	360	110	480	920	220	1,140
68	0	0	0	11,220	1,250	12,470
69	570	350	930	680	650	1,640
70	80	20	90	2,590	1,310	3,900
TOTAL (rounded)	141,810	55,680	197,460	214,210	102,300	318,810

Table 4.7. Distribution of employment by industry, Teesside, 1965–91

Teesplan Industrial Group	September, 1965			forecast 1991		
	male	female	total	male	female	total
district 1: Middlesbrough						
1	150	10	160	130	20	150
2	4,160	400	4,550	1,010	90	1,100
3	3,490	260	3,750	1,340	260	1,600
4	2,430	4,280	6,710	3,170	8 390	8,640
5	3,820	9,600	10 320	6,050	9,200	14,250
6	4,450	4,160	8 610	9 830	9 530	16,460
7	10,080	2,340	12,420	10,790	2,890	13 660
8	1,660	5,380	6,940	2,110	4,840	6,950
9	30	10	40	0	0	0
sub-total, 1–4	10,220	4,960	15,170	6,850	5,740	11,390
5–9	19,940	16,390	36,330	27,870	26,460	64,340
TOTAL (rounded)	30,160	23,340	63,600	33,620	32,200	65,730
district 2: Stockton						
1	500	80	680	650	150	800
2	3,330	140	3,470	880	60	960
3	3,540	820	4,160	4,440	1,190	6 630
4	2,130	1,790	3,920	3,630	2,640	6,170
(new manufacturing) 4	0	0	0	2,800	300	3,100
5	1,760	2 890	4,960	2,390	4,390	6,760
6	2,070	2,240	4,310	3,800	3,670	7,670
7	5,320	1,280	8,600	6,250	1,170	7,420
8	620	1,860	2,610	1,130	2,670	4,000
9	110	10	120	40	10	40
sub-total, 1–4	6,500	2,630	12,130	12,300	4,390	16,690
5–9	8,690	6,290	18,180	13,610	12,270	25,880
TOTAL (rounded)	18,380	10,920	30,310	25,910	16,630	42 540
district 3: Thornaby						
1	0	0	0	0	0	0
2	1,080	140	1,200	970	80	1,050
3	2,060	300	2 360	2,990	630	3,610
4	290	130	420	240	150	390
(new manufacturing) 4	0	0	0	11,220	1,250	12,470
5	390	420	600	860	1,760	2,760
6	380	250	600	730	660	1,390
7	2,600	340	2,940	3,680	790	4,470
8	100	290	390	240	520	760
9	0	0	0	0	0	0
sub-total, 1–4	3,410	560	3,970	16,420	2,100	17 520
5–9	3,450	1,290	4,740	6,830	3,750	9,360
TOTAL (rounded)	6,660	1,860	8,710	21,050	5,850	28,900
district 4: Billingham						
1	16,630	2,230	18,760	10,940	3,160	14,100
2	530	0	630	460	40	500
3	1,780	110	1,860	40	0	40
4	70	310	370	650	530	1,170
(new manufacturing) 4	0	0	0	12,130	1,070	13,200
5	570	740	1,310	1,260	2,290	3 550
6	480	620	1,010	790	730	1,520
7	4,360	170	4,530	6,380	270	6 650
8	220	730	950	810	1,440	2,240
9	100	10	100	120	10	130
sub-total, 1–4	18,880	2,860	21,620	24 220	4 800	29,010
5–9	5,730	2,170	7,800	9,350	4,740	14,090
TOTAL (rounded)	24,600	4,820	28,420	33,570	9,540	43,100
district 5: Eston						
1	13,020	1,030	14,060	13,980	1,800	16,750
2	16 440	410	18,850	16,460	1,390	17,850
3	2,130	170	2,300	1,210	90	1,300
4	990	810	1,800	1,330	690	2,020
5	310	500	800	710	1,300	2,010
6	600	460	1,060	670	520	1,060
7	5,070	150	5,220	4,930	220	5150
8	160	630	680	410	960	1,370
9	40	0	40	10	0	10
sub-total, 1–4	34,870	2,230	36,800	32,960	3,970	36 920
5–9	9,170	1,620	7,800	6,630	2,990	9,620
TOTAL (rounded)	40,750	3,650	44,600	39,680	6,960	46,540

Table 4.7. Distribution of employment by industry, Teesside, 1965–91—cont.

Teesplan Industrial Group	September, 1968 male	September, 1968 female	September, 1968 total	forecast 1991 male	forecast 1991 female	forecast 1991 total
district 6: Redcar						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	60	0	60
4	60	110	170	120	60	180
(new manufacturing) 4	0	0	0	1,750	200	1,960
5	440	1,010	1,440	1,150	2,110	3 270
6	910	940	1,880	1,290	1,390	2,880
7	1,330	290	1,620	1,590	350	1,950
8	340	680	1,020	840	2,250	3,100
9	80	0	80	20	0	20
sub-total, 1–4	60	110	170	1,940	260	2,200
5–9	3,090	2,920	6,010	4,900	6,130	11,020
TOTAL (rounded)	3,150	3,020	6,150	6,530	8,390	13,220
district 7: Nunthorpe–Merton						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	50	0	70	100	10	110
4	0	0	0	0	0	0
(new manufacturing) 4	0	0	0	5,980	1,230	7 220
5	120	100	220	530	1,530	2 360
6	70	90	160	710	640	1,340
7	1,160	140	1,300	4,200	310	4,510
8	130	590	720	1,820	3,640	5,460
9	150	0	180	160	20	180
sub-total, 1–4	70	0	70	6,090	1,240	7,330
5–9	1,660	920	2,580	7,710	5,140	13,850
TOTAL (rounded)	1,730	920	2,580	13,800	7,380	21,180
district 8: Eaglescliffe–Yarm						
1	490	40	530	520	80	600
2	40	10	50	0	0	0
3	260	40	300	1,930	170	2,100
4	500	40	540	460	150	600
(new manufacturing) 4	0	0	0	9,050	1,710	10,960
5	90	120	220	1,170	2,140	3,310
6	690	250	950	1,300	870	2 170
7	430	50	480	6,960	440	7,400
8	70	200	270	930	2,050	2,980
9	470	30	490	220	30	250
sub-total, 1–4	1,290	120	1,410	12,180	2,100	14,260
5–9	1,750	650	2,400	10,560	5,530	16,110
TOTAL (rounded)	3,040	770	3,820	22,740	7,630	30,370
district 9: Stillington						
1	0	0	0	0	0	0
2	80	10	80	40	0	40
3	70	10	80	0	0	0
4	480	110	590	410	110	520
5	20	20	40	10	30	40
6	20	10	30	80	70	150
7	130	20	150	100	0	100
8	10	30	40	10	20	30
9	310	20	320	250	40	290
sub-total, 1–4	630	130	750	440	120	560
5–9	490	100	580	450	160	610
TOTAL (rounded)	1,120	220	1,340	900	270	1,170
district 10: Sedgefield						
1	240	0	240	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	20	0	20	20	0	20
(new manufacturing) 4	0	0	0	1,550	170	1,720
5	110	120	230	50	110	170
6	170	100	270	100	90	190
7	120	40	160	130	0	130
8	610	900	1,510	400	1,400	1,800
9	1,570	10	1,580	120	20	140
sub-total, 1–4	260	0	260	1,560	180	1,740
5–9	2,570	1,170	3,740	820	1,610	2,430
TOTAL (rounded)	2,830	1,170	4,010	2,380	1,790	4,170

Table 4.7. Distribution of employment by industry, Teesside, 1965–91—cont.

Teesplan Industrial Group	September, 1965 male	female	total	forecast 1991 male	female	total
district 11: Saltburn–Marske						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	30	0	30	130	10	140
4	190	170	360	210	120	320
(new manufacturing) 4	0	0	0	2,490	510	3,000
5	100	260	370	190	340	530
6	310	400	710	340	300	640
7	440	130	570	580	50	630
8	60	390	450	300	680	970
9	80	0	80	50	10	60
sub-total, 1–4	210	170	390	2,820	840	3,460
5–9	1,000	1,180	2,170	1,460	1,370	2,830
TOTAL (rounded)	1,210	1,350	2,560	4,260	2,010	6,290
district 12: East Cleveland						
1	20	0	20	170	30	200
2	2,430	60	2,490	0	0	0
3	10	20	30	340	20	360
4	100	290	390	70	330	400
(new manufacturing) 4	0	0	0	3,870	760	4,420
5	210	360	680	230	430	660
6	290	250	540	260	230	490
7	410	90	500	480	130	600
8	50	370	420	260	560	820
9	360	10	380	260	40	300
sub-total 1–4	2,550	380	2,930	4,250	1,130	5,380
5–9	1,310	1,060	2,400	1,490	1,360	2,870
TOTAL (rounded)	3,860	1,460	5,330	5,740	2,510	8,250
district 13: Guisborough						
1	0	0	0	0	0	0
2	430	10	440	420	30	450
3	0	0	0	0	0	0
4	130	410	540	160	450	600
5	190	260	440	360	650	1,000
6	230	170	400	410	350	760
7	320	50	360	230	20	250
8	130	380	500	210	480	690
9	130	0	160	130	20	150
sub-total, 1–4	560	420	980	570	480	1 050
5–9	1,050	850	1,900	1,340	1,510	2,850
TOTAL (rounded)	1,810	1,270	2,880	1,910	1,990	3,900
district 14: Stokesley						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	40	10	60	100	120	220
5	70	130	200	120	220	340
6	260	130	390	480	390	860
7	460	100	560	810	70	880
8	60	330	390	130	300	430
9	530	20	550	380	60	430
sub-total, 1–4	60	10	60	100	120	220
5–9	1,410	720	2,120	1,910	1,030	2,940
TOTAL (rounded)	1,450	720	2,170	2,010	1,160	3,150

Note: see note, table 4 5.

Status of employment, September 1965

4.20 The classification of employment according to status relied on the ratios of blue-collar to white-collar jobs for each industrial group according to the Home Interview Survey. These ratios were then applied to the estimated employment in each group (see table 4.8).

Table 4.8. Status of employment, Teesside, 1965

Teesplan Industrial Group	employment in white-collar jobs (per cent)
1. Chemicals	27.9
2. Metals	20.0
3. Engineering and shipbuilding	20.6
4. Other manufactures	17.8
5. Retailing	66.8
6. Central services	68.4
7. Non-personal services	27.1
8. Health and education	74.1
9. Agriculture and extractive	40.5
TOTAL	36.1

Source: Home Interview Survey.

4.21 The distribution of employment of white-collar and blue-collar jobs by the Home Interview Survey definition was much more difficult to calculate. Only for male jobs in manufacturing was there virtually no difference in the classification of status between the Home Interview and Employment Surveys. About 36 per cent of the male white-collar jobs in services according to the Home Interview Survey definition were classified as blue-collar jobs in the Employment Survey: these included, for instance, school teachers because of the way in which the survey forms were completed. The zonal distribution of these jobs was estimated by applying an expansion factor of 36 per cent to data from the Employment Survey. The problems of comparing the data on female jobs from the two sources were so great that it was not possible to make a meaningful distinction between blue- and white-collar jobs that would assist the transportation analysis. The final, estimated status of employment used in the analysis is given in table 4.9.

Table 4.9. Employment by sex and status, Teesside, September 1965

	manufacturing	services	total
male, white-collar jobs	17,100	21,900	39,000
blue-collar jobs	65,200	37,600	102,800
female	14,400	41,300	56,700
TOTAL (rounded)	96,700	100,800	197,500

Note: manufacturing is TIG's 1–4, services, TIG's 5–9.

Validity of the estimate of employment

4.22 The validity of the estimate of employment on Teesside in September 1965, given in table 4.5 and subsequent tables, must be tested. The figures are in terms of the numbers of people actually at work in work places within the survey area. They exclude the registered unemployed who live on Teesside and the residents of Teesside who work elsewhere; and include non-residents travelling to work places within the survey area. If, therefore, the estimated employment is adjusted to give an estimate of the resident labour supply, it can be compared with the estimate of labour supply made in chapter 2, and with the returns from the Home Interview Survey.

4.23 The calculated size of the resident labour supply based on the estimated figures of total employment is given in table 4.10, the estimated net inward travel-to-work being taken from the Cordon Survey and confirmed by comparison with the Census of Population, 1961. The general question of travel-to-work exchanges with places outside Teesside is discussed in chapter 6.

Table 4.10. Estimated employment situation, Teesside, September 1965

	male	female	total
employment at work	141,790	55,700	197,490
add, registered unemployment	2,840	1,160	4,000
subtract, net inward travel-to-work	8,000	570	8,570
estimated resident labour supply	136,630	56,290	192,920

4.24 The three alternative estimates of resident labour supply are shown in table 4.11. They show an apparent range of values of some magnitude but the divergences are capable of reasonable explanation to an extent that the estimated total employment at work given in table 4.6 can be accepted as being reasonably accurate.

Table 4.11. Range of estimates, resident labour supply, Teesside, 1965

source of estimate	male	female	total
employment situation	136,630	56,290	192,920
Home Interview Survey	134,900	83,200	218,100
activity rates	148,300	59,800	208,100

Sources: employment situation, for September 1965, from table 4.10;
Home Interview Survey, between October 1965 and March 1966;
activity rates, for mid-1966, from table 2.12 but adjusted to September 1965 *pro rata* with the change in the Registrar General's mid-year estimates of population, 1965 and 1966.

4.25 The estimates for male labour supply according to the Home Interview Survey and the employment situation are consistent with each other, given that the Home Interview Survey is a sample survey. The higher figure from activity rates is based on a long term analysis and forecast of activity rates, using 1961 as the base year for projection. As 1961 was a year of relatively high economic activity on Teesside, when unemployment was low, the long term forecasts of activity rates, including that for 1966, should be taken as describing a similar type of situation. In fact, however, the economy of Teesside in mid-1966 was still only recovering from the effects of the 1963 depression. It seems certain that activity rates in mid-1965 were relatively low because of this, of the order of 81.4 per cent for the population aged over 16 years, compared with 83.3 per cent forecast for 1966 in chapter 2 (see table 2.13). Confirmation that this was the real situation is given by comparing known changes between mid-1965 and mid-1966. The Registrar General's mid-year estimates show an increase in population of 4,430 which indicates an increase of about 1,600 in the total male population aged 15 years and over. But the Ministry of Labour returns show that male employment increased by 6,000 during the same period (see table 4.3), sufficient to have increased the activity rate to about 84.2 per cent.

4.26 The figures of female labour supply from the employment situation and the activity rates forecast are consistent with each other assuming that female activity rates in mid-1965 were slightly lower than those forecast in chapter 2, for the same reason as in male activity rates. The lesser effects of cyclical depression on female activity rates is noteworthy and is examined in the next section. The substantially greater estimate from the Home Interview Survey is a result of a difference in the definitions of employment The Ministry of Labour estimates count only those people working more than ten hours weekly, but the Home Interview Survey included people working less than ten hours weekly (see chapter 2, paragraph 2.16).

Recent trends in the employment structure

4.27 Reliable figures for the analysis of Teesside's employment structure are available from 1954 to 1966: returns for earlier years present problems of incompleteness and data for 1967 were not available at the time of analysis. Total insured employment on Teesside increased by 30,000 between 1954 and 1966, from 166,000 to 196,000 excluding registered unemployed (see table 4.12). This represented an overall rate of increase slightly faster than that for Great Britain and nearly three times as fast as that for the rest of the Northern Region (see table 4.13). In fact, for the period since 1951, the rate of increase in employment on Teesside has been more than twice as fast as in either of the two other areas of the North East identified as 'growth' areas in the North East White Paper, that is, Tyneside and Darlington. This growth in employment has been marked by a continuous growth in population sustained by a net annual inward migration until 1961. Since then population has grown at a slower rate and there has been a net annual outward migration (see chapter 1, table 1.19).

Table 4.12 Insured employment, Teesside Employment Area, 1954–66 ('000's)

	employment			unemployment		
	male	female	total	male	female	total
1954	123.8	42.5	166.3	1.4	1.1	2.5
1955	125.9	43.7	169.6	1.1	0.9	1.9
1956	129.1	46.0	175.1	0.9	0.6	1.5
1957	129.2	46.8	176.1	0.8	0.7	1.7
1958	132.1	46.9	179.1	2.5	1.0	3.5
1959	127.5	47.1	174.6	4.5	1.6	6.2
1960	131.9	49.3	181.3	2.3	1.1	3.4
1961	134.3	51.4	185.7	1.9	0.6	2.9
1962	126.5	51.6	178.0	6.6	1.5	8.1
1963	122.4	50.6	173.0	8.4	2.2	10.6
1964	128.3	53.4	181.7	4.2	1.3	5.4
1965	132.5	54.3	186.8	2.6	1.0	3.6
1966	138.9	57.8	196.7	2.1	0.7	2.8

Source: Ministry of Labour employment returns and unemployment figures for June, for employment exchanges on Teesside;
Notes: employment is numbers of insured workers in employment, excluding self-employed, insured civil servants, and registered unemployed;
unemployment is registered unemployed

4.28 This overall increase in employment, however, masks a considerable range of cyclical fluctuation in which total employment has varied inversely with total unemployment. Years of relatively high employment and low unemployment were 1958, 1961 (more markedly), and 1966; years of lower employment and high unemployment were 1954, 1959 and, most markedly, 1963 when the average unemployment rate was more than 5 per cent for nearly the whole year, and 8.3 per cent in February. It seems probable that during 1967 there was a further downturn in employment on Teesside as there was an increase in unemployment.

4.29 Within this cyclical fluctuation, however, there are contrasts between male and female records. Briefly, male employment and unemployment followed the cyclical course of total figures though in a more intense form, whereas there was a steady increase in female employment through the entire period except 1963, with much less variation in unemployment, even at the peak of the 1963 depression. The facts are best illustrated by comparing 1963 and the prosperous year of 1966, and comparing summer and winter figures to show the effects of seasonal variation, in table 4.14.

4.30 The contrast was even stronger between manufacturing and service employment, the changes being of

Table 4.13. Summary of changes in employment, 1954–65

Teesplan Industrial Group	percentage change between annual averages, 1954–56 and 1963–65 Teesside	remainder, Northern Region	Great Britain
1. Chemicals	+29.0	+ 4	− 1
01, 03 basic chemicals, plastics and man-made fibres	+33.8	+ 8	+ 4
2. Metals	− 7.7	+ 13	+ 1
11 iron and steel	− 8.3	+ 17	+ 8
12 castings	− 5.3	+ 8	− 2
3. Engineering and shipbuilding	−20.0	− 7	+ 5
21 shipbuilding	−36.3	− 28	−26
22 industrial plant, steelwork	−11.5	+ 15	+ 7
4 Other manufactures	− 4.5	+ 3	+ 1
31 bread and flour	+ 4.1	− 21	−17
34 outerwear	+15.5	+ 2	−18
36 building materials	+ 1.4	+ 5	+ 8
37 timber	+25.7	+ 8	+ 2
38 printing	+11.0	+ 15	+11
39 telephone apparatus	+24.6	+107	+32
40 woollens	−17.3	+ 19	− 7
5 Retailing	+36.1	+ 29	+26
6 Central services	+12.6	+ 7	+15
7 Non-personal services	+13.7	+ 8	+11
8 Health and education	+55.0	+ 35	+29
9 Agriculture and extractive	−36.8	− 28	−24
TOTAL	+ 8.6	+ 3	+ 8

Source: Ministry of Labour, employment returns for Teesside; Ministry of Labour *Gazette* for Northern Region, Great Britain.
Notes: only the largest sub-groups have been separately shown for TIG's 1–4;
entry for TIG 22 for Northern Region also includes TIG 23, other engineering.

Table 4.14. Registered unemployment, Teesside Employment Area, 1963–66

	numbers unemployed		unemployment rate (per cent)	
	1963	1966	1963	1966
male:				
February	13,560	3,000	10.2	4.9
June	8,340	2,140	6.4	4.2
female:				
February	2,630	860	2.2	1.6
June	2,230	660	1.6	1.2

Source: Ministry of Labour unemployment returns for employment exchanges in the Teesside Survey Area

crucial importance in illustrating the changing employment structure of Teesside. Total employment in manufacturing industry reached a peak of 106,000 in 1958, then declined sharply to 95,700 in 1963 but has since shown a slight recovery to 99,100 in 1966 (the figures include registered unemployed). But total employment in service industry has continuously increased, from 68,800 in 1954 to 72,100 in 1958 and thereafter at a more rapid and accelerating rate to 97,100 in 1966. The depression of 1963 had no discernible effect on employment in service industry, its effects being entirely confined to manufacturing.

4.31 A closer examination of the figures for manufacturing employment shows that the patterns for the five industries are quite different (see table 4.15):

a employment in chemicals showed a rapid increase between 1954 and 1958, and a slower rate of increase to 1962. This was the period during which ICI Wilton was set in operation on the south bank of the Tees. Since 1962, employment has remained roughly constant;

b employment in metals, mainly iron and steel manufacture, remained roughly constant to 1961, though with a slight peak in 1958. During 1961–62, there was a drop in insured employment of 5,500 as several older works closed. The real fall in employment was greater as these figures include registered unemployed. Employment has remained constant since 1962;

c employment in heavy engineering showed a slow rise to 1958, and has declined since then, the effects of the 1963 depression being marked;

d shipbuilding employment fluctuated between 1954 and 1958, but since then has fallen by 40 per cent as shipyards have closed and a further major decline is likely if the last shipbuilding yard closes, leaving only a single ship repair yard open;

e finally, other manufacturing employment showed a slow decline between 1954 and 1961, when it stood at 15,900. There followed a slow, but steady increase to 18,800 in 1966, partly because of renewed Government action after the area was included as a development district in the 1963 depression.

4.32 The turning point in manufacturing employment is therefore about 1961–62. Before then, metals, engineering and shipbuilding were the largest sector of manufacturing employment, with a total of 53,200 in 1954 compared with 40,900 in chemicals and other manufacturing. But by 1966 the relative position was reversed, with 45,800 in the metals group and 53,300 in chemicals and other manufactures.

4.33 A further distinctive feature of these changes in the different sectors of manufacturing industry is that they were quite different, even contrary in direction, to the changes in the same sectors of industry in the rest of the Northern Region and in Great Britain (table 4.13). Thus Teesside was the scene of a major investment in the chemical industry, but its sections of iron and steel smelting, shipbuilding and heavy engineering were declining.

4.34 This was not the situation in service industry, however. The continuous increase in employment has been noted. It is equally important to note that the rate of increase in employment in every sector of services on Teesside was considerably faster either than in the rest of the Northern Region or in Great Britain as a whole. The figures can be shown in greater detail as an average annual rate of change between 1959–65 (table 4.16).

4.35 The positive rate of change in service employment and the negative rate in manufacturing and primary employment leads to a situation where the service ratio, the proportion of all workers in service employment, is increasing and the structure of employment is changing. This structural change is significant, marking a change associated with all highly developed economies. Thus, the service ratio in U.S.A. was 64 per cent in 1963 compared with about 67 per cent in Great Britain.

4.36 The national figures, however, mask wide geographical variations in the service ratio. The ratio is high in London and the South East, low in Scotland, Wales and the Northern Region. This variation is not only associated with regional prosperity. Thus the strong manufacturing base of the West Midlands economy,

Table 4.15. Insured employment by Teesplan Industrial Group, Teesside, 1954–66 ('000's)

TIG	TIG 1 Chemicals	TIG 2 Metals	TIG 21 Shipbuilding	TIG 22, 23 Engineering	TIG 24 Other manufactures	TIG 71 Construction	TIG 5, 6, 7 (rem.), 8 Other services	TIG 9 Agriculture and extractive
1954	23.7	33.7	7.2	12.3	17.2	12.3	56.5	5.6
1955	26.3	32.7	7.0	12.8	16.6	12.4	57.1	4.9
1956	27.2	33.3	6.7	13.6	16.0	13.7	58.2	4.7
1957	29.1	34.1	6.6	13.4	16.1	13.8	56.2	4.4
1958	32.4	35.0	6.8	14.2	17.6	13.2	58.9	4.4
1959	33.2	31.4	7.1	13.5	18.3	12.0	63.0	4.3
1960	33.4	34.0	6.1	12.7	17.2	12.4	64.3	3.8
1961	36.0	34.8	6.3	13.2	15.9	13.3	67.2	3.8
1962	35.2	29.3	6.9	12.4	16.8	13.6	68.2	3.7
1963	32.7	30.9	4.4	10.6	17.1	13.9	70.4	3.6
1964	33.8	29.9	4.6	11.3	17.3	14.7	72.2	3.1
1965	33.1	31.0	4.1	12.2	17.8	16.7	72.4	2.9
1966	34.7	29.6	4.3	11.9	18.6	22.7	74.4	2.9

Source: Ministry of Labour employment returns for June for employment exchanges on Teesside;
Note: figures include registered unemployed.

Table 4.16. Changes in employment structure, 1959–65

	average annual per cent change in employment			percentage employed in services	
	manufacturing and extractive	service	total	1959	1965
Teesside	−0.6	+3.0	+1.7	41.2	46.8
Northern Region	−0.7	+2.4	+0.8	50.0	54.0
Great Britain	−0.3	+1.7	+0.6	54.4	57.1

Source: Ministry of Labour employment returns for employment exchanges and Ministry of Labour *Gazette*

and the shortage of labour, have kept service ratios low. In South West England, the shortage of manufacturing industry, the importance of the tourist industry and the availability of labour give high service ratios. Another factor is the influence of tastes and ways of life, dependent only partly on income, on the kind and volume of service required.

4.37 The exceptionally low service ratio on Teesside can be understood only in these terms. Personal incomes are low but of greater importance was the strength of the manufacturing sector and its growth in the 1950's. Further, Teesside is a very rare British example, for its size, of a virtually self-contained urban area in which the service industries serve only the local hinterland. It does not act as a regional centre for public or private administration, nor does it provide commercial services to a wide area

4.38 In a sense, therefore, the rapid rate of increase in service employment since 1958 represents a process of catching up with national levels of provision once the pressure of demand for labour from manufacturing industry had begun to slacken, and the regional tastes and demands begin to approach the national pattern. But this increase is still largely confined to employment in retail distribution, health and education services and the special case of the construction industry. Employment in the remaining services, including administration, commerce and the professions, continues to be relatively low.

4.39 The exceptional feature about employment in construction is the extremely rapid rate of increase in recent years. This reflects, almost entirely, changes in the volume of investment in plant and machinery by the steel and chemical industries. Investment at the three main works (ICI Billingham, ICI Wilton and Dorman Long (Steel), at Lackenby) has been at an annual average of £22 million between 1954 and 1955; £36 million between 1956 and 1958; and £20 million between 1959 and 1963 (article by Dr. Jeremy Bray, M.P., *Guardian*, 30th April 1964). The comparable figure for 1965 was about £58 million, accompanied by an increase of 8,000 in employment in the construction industry.

4.40 The recent structural changes in the economy of Teesside can therefore be summarised as follows:

a between 1954 and 1958 population growth was sustained by inward migration, but an increase in service employment was restrained by the rapid growth of employment in chemicals, nearly all of it the result of heavy investment at ICI Wilton,

b between 1958 and 1962 there was a transitional period when the main change in manufacturing industry took place, with the stabilisation of employment in chemicals, and the decline of employment in metals, engineering and shipbuilding;

c from 1962 onwards, population growth has been maintained at a reduced rate, with net outward migration; employment in manufacturing industry has until recently been declining which has enabled a rapid increase in service employment by making more labour available.

4.41 Short term cyclical variations, including the 1963 depression, have introduced slight distortions of basic structural change. The most interesting is that at times of relatively high unemployment induced by changes in manufacturing industry there is a tendency for service employment to rise. This applies particularly to female employment in services when, possibly, more women are looking for work at a time when male earnings and family incomes are lower than usual. A similar type of situation is reported as arising in the shipbuilding industry. Firms reported that it was easier to find labour at times when other industries were in cyclical periods of lower levels of investment, particularly the chemical industry and the associated part of the construction industry.

4.42 All the evidence suggests, therefore, that the recent changes in the employment structure of Teesside have been the result of secular trends in the different manufacturing industries in a situation where there is competition for labour in the short term, particularly between the service and the manufacturing sectors, but also between different manufacturing industries.

5 The locational requirements of industry

Industry and urban structure

5.1 This chapter is based on an analysis of data from the Manufacturing and Warehousing surveys, related to works published on the location of industry and on special reports on the prospects for expansion in selected industries, particularly the Stage I report of the Development Co-ordinating Committee of the British Iron and Steel Federation (1966), the so-called Benson Committee, which, although views have evolved since its publication, was the most important source of reference for the future of the British steel industry at the time of writing this report.

5.2 The object of the analysis is to establish the locational requirements within Teesside for its industrial expansion. Matters relating to employment itself, including industrial densities, are considered in chapters 6 and 7. The analysis shows a marked division in Teesside's industrial economy between heavy industry and light industry. This division is found in the relationship between Teesside and the rest of the country, it is found in the nature and volume of supplies of raw materials and markets for industry; it is found in the transport requirements of the two sectors; above all, it is found in the siting requirements of heavy and light industry. Heavy industry may be described as being site oriented: that is, its future growth depends on land being available in a specific type of location and, if suitable land is not available, industrial development will not take place. Light industry, on the other hand, is flexible in its choice

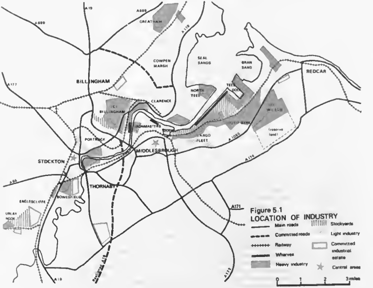


Figure 5.1
LOCATION OF INDUSTRY

of location provided only that an adequate supply of labour is available.

5.3 From this analysis of Teesside's industry is derived the three classes of industrial activity to be provided for as part of urban structure policy:

a heavy, capital-intensive industry: this is Teesside's distinctive, riverside belt of activities, dependent on imported raw materials, reliant on rail and sea transport; urban structure policy distinguishes between the land currently in use and the land uniquely suitable for the expansion of these activities on Teesside and therefore to be reserved for their use;

b labour intensive industry: this is located mainly on industrial estates relying on road transport and employing relatively large numbers of workers but otherwise flexible in its choice of location;

c storage and service industry: this has been separately identified but includes two different types of activity, namely, the storage uses and stockyards ancillary to heavy industry but not likely to generate noise or atmospheric pollution; and the warehousing, wholesale distribution and service industries serving Teesside and normally seeking a central location within their market area, easily accessible by road; both types of activity are comparatively small employers of labour.

5.4 The steel industry on Teesside comprised three firms at the time of survey. Since then, the industry was nationalised, the three firms becoming part of the Northern and Tubes group of the British Steel Corporation. For convenience, however, reference in this report is made to the three original firms, unless the contrary is indicated.

Trading basis of the Teesside economy

5.5 Many factors enter a consideration of future industrial development on Teesside. A useful introduction is given by a statement of Teesside's trading relationships. Teesside earns its living by the provision of goods and services to other regions of the United Kingdom and by exports. The income gained in this way is redistributed within Teesside by a series of local transactions. These transactions, internal and external, are described in this section, relying mainly on data collected from the Manufacturing Survey in which the sources of supply and the markets for Teesside's industries were identified.

5.6 Current economic theory includes methods of analysis whereby the multiplier effect of an increase in the external demand for a region's products may be calculated by a form of input–output analysis. For example, if there should be an increase of 10 per cent in the demand for agricultural fertiliser produced by Teesside's chemical industry this might generate an increased demand for the products of other industries or services on Teesside. Input–output techniques can be thus used to make reasonable forecasts of the increase in employment in local industries arising from an increased employment in the basic industries, such as chemicals, which serve external markets.

5.7 These techniques, however, can best be used only for regions where the volume of intra-regional trade is substantially greater than the inter-regional trade. But the volume of intra-regional trade on Teesside is comparatively small: its basic industries are oriented almost exclusively to external markets and linkages with local markets are slender. This is mainly a function of the size of the local market. In addition, the analysis of recent trends in the employment structure of Teesside given in the last chapter suggests that questions of the availability of labour on Teesside make difficult any direct measurement of multiplier effects. Finally, the method requires statistics of a coverage and accuracy not often found for a region as small as Teesside.

5.8 For these reasons, therefore, this method of analysis has not been used for forecasting the future growth of employment on Teesside. Instead, the forecasts have been related to an analysis of trends in production and productivity in individual manufacturing industries and, for larger parts of the service sectors, to forecasts of the total growth in population. But the trading relationships of the Teesside economy need to be clearly understood as a basis for these sectoral forecasts, even if a rigorous input–output analysis cannot be made.

Inter-regional relationships

5.9 A first, rough indication of the direction of Teesside's business interests is given by an analysis of the geographical pattern of telephone calls to and from Teesside (table 5.1). This is a valid general statement about business interests as only 27 per cent of the Post Office receipts for telecommunications are from private subscribers.

Table 5.1. Telephone traffic to and from Teesside, May 1966

	percentage of total outgoing traffic	percentage of total incoming traffic
Hartlepool, Darlington	**21**	27
Newcastle upon Tyne	**27**	20
remainder of Co. Durham	**8**	9
remainder of North Riding	**9**	8
East and West Ridings	**13**	12
North West England	**6**	6
West Midlands	**3**	4
London and South East	**11**	11
Glasgow	**2**	2
TOTAL (rounded)	100	100

Source: G.P.O., Middlesbrough Telephone Area

Notes: Teesside is approximately the Teesside Survey Area. The designation of Newcastle upon Tyne includes traffic with that centre and also traffic with other centres not listed in the table, such as Bristol, Nottingham and Edinburgh, whose telephone traffic with Teesside is routed via Newcastle.

5.10 A more detailed indication of commercial linkages is given by the Cordon Survey of vehicles crossing the boundary of the Teesside Survey Area. A small proportion (14.6 per cent) of the total number of trips of commercial vehicles crossing the boundary is by vehicles passing through Teesside without stopping. In total, however, the Commercial Vehicles and Cordon Surveys together showed that only 20 per cent of all trips made by commercial vehicles in the Teesside area involved a journey crossing the survey boundary, a lower ratio than for telephone traffic of which about 30 per cent was for external calls. The Cordon Survey data demonstrate the great importance amongst external trips of those with Hartlepool and Darlington and with the nearer parts of County Durham and North Riding (table 5.2).

5.11 The different purposes for which these external trips were made was shown by the Commercial Vehicles Survey, a special survey of vehicles based on Teesside. These showed that the most important type of destination was a residential use, that is deliveries made to private residences; they accounted for 31 per cent of all trips. Other important types of destination were trips

Table 5.2. Average weekday trips by commercial vehicles to and from Teesside, 1965

fine zone	area of origin or destination	total trips	per cent of total
222	Hartlepool	3,859	19
226	Darlington	1,948	10
sub-total		5,807	29
212	East Durham coast	1,139	6
213	Sunderland	847	4
214	Durham City	779	4
215	Chester–Consett	277	1
217	South West Durham	1,969	10
218	Aycliffe	817	4
sub-total		5,848	29
220	Richmond, Yorkshire Dales	1,231	6
221	Northallerton	337	2
223	Thirsk	272	1
224	Helmsley	158	1
225	Whitby–Scarborough	1,030	5
sub-total		3,028	15
216	Tyneside, Northumberland, Scotland	2,043	10
219	Cumberland, Westmorland, Furness	367	2
227	Remainder of England and Wales	3,025	15
sub-total		5,435	27
TOTAL		20,118	100

Source: Cordon Survey.

to wholesaling and other activities in TIG 7, accounting for 25 per cent of all trips, and to retailing establishments, 20 per cent. Trips by commercial vehicles to manufacturing industry were comparatively few, only about 12 per cent of the total.

5.12 Additional data from the British Railways Board, in their report on *The Development of Major Trunk Routes* (February 1965), show that the majority of freight flows carried by rail to or from the North East coast passes through Northallerton, to or from areas south of Teesside. This, of course, excludes short distance movements of coal from the Durham coalfield to Teesside. The Board's projection of future freight traffic likely by 1984 shows that about 85–90 per cent of the freight movements to and from Teesside are expected to be with areas south of Teesside, excluding the traffic in Durham coal.

5.13 Finally, analysis of retailing shows that Teesside is relatively self-contained. The net movement by persons on shopping trips crossing the survey boundary is less than 2 per cent of the total number of shopping trips. The total movement is greater but is predominantly with Hartlepool and Darlington and the nearer parts of County Durham and North Riding (see chapter 14).

5.14 The conclusion of this brief account of inter-regional relationships is that business linkages with Newcastle are important but that general commercial connections for more than short distances are more important to the south of Teesside than with the rest of the North East. The exceptions to this are the linkages with Hartlepool and Darlington. These are sufficiently strong to justify the use of the term, 'Wider Teesside' to describe the area from Darlington to the sea, an area with a comparatively closely integrated economy. This indeed is the term used by House and Fullerton in *Teesside at Mid-Century* (London, 1960), the standard work on the economic geography of the area.

Industrial supplies

5.15 The economic growth of Teesside has been the result of development in heavy industry, characterised by the use of bulky raw materials and the manufacture of relatively bulky products; commercial activities were virtually absent from this history. As a result, the growth of the area presents day offers a clear demonstration of well-established theory for the location of industry. By this theory, the main requirement for the choice of location for manufacturing industry is the minimisation of transport costs between sources of raw materials and fuel, places of manufacture and ultimate markets.

5.16 The relative importance to Teesside of local resources, those brought in by land, and those imported by sea, have varied at different periods. Early development in the nineteenth century, including the foundation of Middlesbrough as a new town centre, was based on the export of Durham coal, brought to the river Tees by rail. Later, the exploitation of the iron ore seams of the Cleveland Hills after 1850 led to the establishment of an iron industry. The early location pattern of the various works reflected the balance of railway transport costs between Cleveland iron ore and Durham coal.

5.17 Major urban growth was stimulated by the development of the iron industry, with associated activity in foundries, engineering and shipbuilding. Additional growth sprang from the establishment of chemical works after each World War. The establishment of Billingham Works in 1923 reflected the use of Durham coal and the river, but also that of local underground supplies of salt and anhydrite. The establishment of Wilton Works in 1949 reflected access both to Billingham Works and to oil imports via the Tees. By this time, the iron and steel industry had become very largely dependent on imported ore supplies. These had supplemented from an early date the Cleveland production, which averaged six million tons per annum from 1875 to 1910, fell to two million tons in the 1930's, one million tons in 1950 and finally ceased in 1964.

5.18 The main sources of materials for Teesside's industries at the present time are shown in table 5.3. It shows that a threefold division of Teesside's industry is possible:

a those relying heavily on raw materials, for which manufactured products are either of an ancillary nature, such as engineering services, or consist of semi-manufactured products such as coke. This group includes chemicals (TIG 1) and iron and steel (TIG 11). The economies of scale associated with the processing of bulky raw materials are such that labour costs are a relatively small proportion of the total costs of manufacture, yet this group contains 65 per cent of total employment in manufacturing industry on Teesside;

b those relying on manufactured and semi-manufactured products from the steel industry, including foundries, engineering and shipbuilding, wire manufactures, and miscellaneous metal goods (TIG's 3, 12, 13, 32 and 33). These rely mainly on the production of the Teesside steel industry, and contain 23 per cent of the employment in manufacturing industry on Teesside;

c those relying on manufactured products brought mainly by road from other parts of Britain. They are a mixed group of activities employing about 12 per cent of manufacturing workers.

5.19 At present, raw materials produced on Teesside are much less important than imported raw materials. Most of the existing sources lie north of the river Tees: brick clay at Coatham Stob; sand and gravel at Stillington; and coal at Fishburn, the only colliery in the Survey Area. The most important, however, is the brine pumping and anhydrite mines at Billingham, worked by

Table 5.3. Sources of supply for Teesside industries, 1968

Teesplan Industrial Group	Wider Teesside sources of supply		other U.K. sources of supply by land		imports, including coastal traffic via river Tees unless otherwise stated
	raw materials	manufactures, excluding industrial plant	raw materials	manufactures, excluding industrial plant	
1. Chemicals					
01, 03 basic chemicals	anhydrite, brine, (under Billingham Works and Saltholme)	oil distillates (North Tees refinery) tar, etc. (ex steelworks), packaging, printing, etc.	*Durham coal* including 1 million tons p.a. to ICI Billingham	engineering supplies	oil, phosphate, potash, sulphur, sulphate of ammonia, rutile
02 oil refining	–	–	–	–	crude oil
02 coke ovens	Fishburn Colliery (to coke ovens on site)	–	*Durham coal*	–	–
2. Metals					
11 iron and steel	–	coke (mainly from companies' own ovens), oxygen (Teesport works), bricks, castings, engineering supplies	*Durham coal* *home ore* (Northants) *lime* (Durham and W. Riding) *dolomite* (Durham) sand	*scrap* oil (via Teesport tank farms), bricks, castings, engineering supplies	iron ore (3.5 million tons via Tees, plus additional amount via Hartlepool), other ores, including manganese, sand, coke, scrap, pig iron
12 & 13 iron and brass foundries	sand predominantly from Tees Estuary area)	engineering supplies	–	*pig iron,* *scrap,* *coke*	miscellaneous
3. Engineering and shipbuilding					
21 shipbuilding	–	*steel* (45,000 tons from Teesside works), engineering supplies	–	miscellaneous equipment from other regions	main engines (N. Ireland)
22 heavy engineering	–	*steel plate, sections, castings, components, etc.* (60–70 per cent of total manufactured on Teesside)	–	–	–
22 & 23 miscellaneous engineering (firms employing less than 200)	–	steel and components (50–60 per cent of total manufactured on Teesside)	–	–	–
4. Other manufacturing					
36 building and insulation materials	brick clay (Coatham Stob), sand (Stillington area and estuary)	steelworks' slag, tar and other by-products (cement clinker) chemical by-products (cement clinker)	gravel (Scorton)	–	small
37 timber	–	–	West Durham	–	timber principally via Hartlepool, but also Tees and Whitby)
34 outerwear	–	–	–	finished fabrics (mainly from firms' Leeds HQ)	–
35 light clothing	–	–	–	finished fabrics (miscellaneous sources)	small quantities of materials via other ports
39 telephone apparatus	–	–	–	equipment from firm's works at Coventry and Aycliffe	–
40 woollens and knitwear	–	yarn, etc. (from Darlington)	–	yarn, etc. (from Lancs., W. Riding)	–
33 miscellaneous metal goods	–	metals (majority of firms depend chiefly on Teesside supplies)	–	–	–
32 wire manufactures	–	steel rods	–	–	–
41 other miscellaneous	–	miscellaneous (20–30 per cent of total supplies)	–	miscellaneous (70–80 per cent of total from rest of U.K.)	–
31 bread and flour	–	–	–	flour (predominantly from Tyneside mills)	–
38 printing and publishing	–	–	–	newsprint, etc. (predominantly from south)	–

Table 5.3.—*continued*

Teesplan Industrial Group	Wider Teesside sources of supply		other U.K. sources of supply by land		imports, including coastal traffic, via river Tees unless otherwise stated
	raw materials	manufactures, excluding industrial plant	raw materials	manufactures, excluding industrial plant	
77 Warehousing and Storage					
wholesalers	—	—	fresh provisions, principally from south	miscellaneous (local supplies very small, and rest predominantly from south)	miscellaneous imports via Tees very small compared with other ports
coal and builders' merchants	—	—	coal (including large percentage from Yorkshire)	miscellaneous building products (about 10 per cent of supplies of Teesside origin)	—
metal merchants	—	scrap	—	nuts, bolts, tubes (predominantly from south)	—
oil storage	—	—	—	—	—
9 Agriculture and Extractive					
91 agriculture, forestry and fishing	—	fertiliser, etc (part of Teesside origin)	—	fertiliser, etc	—
92 coalmining	—	—	—	—	—
93 other mining and quarrying	—	—	—	—	—

Source: Manufacturing Survey, E.S.2.
Notes. wider Teesside is Survey Area, Hartlepool, Darlington;
materials in italics carried mainly by rail.

ICI. The anhydrite mines, employing 330 workers, are important for the manufacture of ammonium sulphate and sulphuric acid though imported sulphur is a cheaper source of supply for sulphuric acid at times of normal prices.

5.20 Two recent discoveries of economic deposits of natural gas and potash may become sources of supply for the chemical industry. These are discussed later in the chapter.

5.21 Since World War II, however, imports of foreign raw materials have become the main source of supply for Teesside's primary industries. In the case of the steel industry, an average of 3.1 million tons of iron ore was imported each year between 1964 and 1966. The other raw materials for the steel industry (coal, coke and limestone) were brought by rail from other parts of the North East. Thus about four million tons of coking coal are brought in each year from the Durham coalfield. The report of the Development Co-ordinating Committee of the British Iron and Steel Federation mentioned fears that the pit closure programme of the N.C.B. might reduce or endanger the supply of high grade metallurgical coking coals, from the Durham coalfield amongst others. The Benson Committee did not expect that any removal of restrictions on imported coal would lead to any reduction in the use of Durham coking coals.

5.22 The other main imported raw material is crude oil. This is used by the chemical industry in which recent technological developments are producing a greater reliance on imported oil, though the situation might change marginally with the advent of natural gas. ICI Billingham still depends heavily on Durham coal for fuel. More than a million tons of coal (that is, 60 per cent of the total tonnage of raw materials used in the works but only 44 per cent of their total value) is still used. Most of the coal is used for the boilers though some is used in the manufacture of sulphuric acid and cement. ICI Wilton depends mainly on imported oil for fuel and feedstock, 1.0 million tons was brought in in 1965, mainly by pipeline from the Teesport oil jetties, but 0.7 million tons of coal are also used.

5.23 The use of the Teesport oil jetties by ICI and by Shell-Mex, which supplies oil to local industry (including steel works), is partly responsible for the major increase in total river imports since the War, an increase from 3.3 million tons in 1948 to 7.6 million tons in 1965.

5.24 The nature and origin of foreign imports to Tessside in 1964–66 are shown in table 5.4. It shows that nearly the entire volume of imports is destined for the steel and chemical industries, 73 per cent of the tonnage being shipped direct to factory wharves. The use of three-year averages in the tables conceals variations in the source and volume of individual supplies apart from those induced by cyclical fluctuations in the Teesside economy or the building of new capacity on Teesside or in overseas countries. Thus from the recession of 1963, when imports were at a low point of 3.8 million tons, to 1966 when they were 6.8 million tons, petrol and oil overtook iron ore as the leading imports. Many changes in sources took place, which suggest that a degree of flexibility in sources of supply is a general characteristic of the Teesside economy as it is for the British economy.

5.25 Manufactured and semi-manufactured products form the main source of supply for Tessside's industry other than steel and chemicals. It has been noted that two-thirds of the employment in manufacturing industry other than steel and chemicals is in steel-using industries which rely to some extent on Teesside as their sources of supply. The remaining manufacturing industries draw their supplies predominantly from manufacturing areas of all parts of the United Kingdom south of Teesside, although the West Riding and Lancashire are predominant. In particular, this group of industries at present makes very little use of river imports; if firms do use foreign imports, they are not usually imported via the river Tees. This conclusion is similar to the conclusion of the *South Hampshire Study* (C. D. Buchanan and Partners, in association with Economic Consultants Ltd., H.M.S.O., 1966) in which it was noted that apart from raw materials such as oil, coal, grain and timber, 'local firms did not normally import a great deal through Southampton both because only a small proportion of their requirements were direct imports and because of the restricted range of services to the port'.

Table 5.4. Average annual trade, river Tees, 1964–66: (a) by country ('000' tons)

	imports	commodity, in order of importance	exports	commodity, in order of importance
foreign trade				
(a) Netherlands	920	(a)	105	(d) (c) (h)
(b) rest of Common Market	418	(a) (b) (e) (d)	235	(g) (h) (a)
(c) Scandinavia	1,612	(e)	130	(a) (h)
(d) rest of Europe	341	(e) (c) (f)	155	(h) (b) (d)
(e) North America	486	(a) (e) (g)	115	(h) (d)
(f) South America	439	(a) (e)	18	(h) (d)
(g) Africa	1,730	(a) (e)	151	(h) (b)
(h) Middle East	441	(a)	42	(b) (h)
(i) Asia	40	(f) (i)	373	(b) (h)
(j) Australia, New Zealand	24	(g)	31	(h) (d)
sub-total	6,353		1,355	
coastal trade	742	(a)	866	(g) (a)
TOTAL	7,095		2,221	

Source: Tees Conservancy Commission (now Tees and Hartlepool Port Authority) for three years ending 31st October 1966.
Notes: commodities, in order of importance, are listed in table 5.4 (b);
trade by country is based on port of shipment including goods transshipped at that port or transferred to it by rail.

Table 5.4. Average annual trade, river Tees, 1964–66: (b) by commodity ('000' tons)

	imports coastal trade	foreign trade	country, in order of importance	exports coastal trade	foreign trade	country, in order of importance
(a) petrol, oils	717	2,547	(a) (g) (h) (f) (e)	277	163	(c) (b)
(b) chemical fertiliser	0	93	(b)	80	356	(i) (a)
(c) plastics	0	0		2	33	(a) (c)
(d) other chemicals	0	104	(c) (b)	20	128	(a) (e)
(e) iron ore	0	3,103	(c) (g) (e) (f) (d)	0	0	
(f) manganese, chrome	0	193	(g) (d) (f)	0	0	
(g) slag, basic materials	2	224	(e)	444	160	(b)
(h) iron and steel mfrs	1	34	(c) (b)	41	470	general
(i) miscellaneous	17	51	(b)	3	44	general
TOTAL	742	6,353		866	1,355	

Source: see table 5.4(a).
Notes: see table 5.4(a);
countries, in order of importance, are listed in table 5.4(a).

5.28 The direction of trade is also significant. Estimates covering 100 of the 131 manufacturing firms relying mainly on manufactured products for their supplies show that only eighteen depend more on supplies from areas to the north of Teesside than to the south. The largest are bakeries, taking supplies from Tyneside flour mills; others take miscellaneous printing supplies and metal goods from the North East as a whole. Thus Teesside's main dependence on the North East lies in its use of mining products, particularly coal, in which employment is likely to fall irrespective of the future growth of production on Teesside. Any future growth in these industries on Teesside is unlikely to lead to any substantial increase in manufacturing employment in other parts of the North East.

5.27 The classification of industry by its source of supplies is confirmed by an analysis of the tonnage of materials handled each year in each industry. The primary industries (steel and chemicals), building materials and wholesalers handle at least 100 tons of materials per man-year, and the steel-using industries, printing and baking, typically handle at least 10 tons. The miscellaneous manufacturing industries in general handle less than 10 tons per man-year: for example, firms manufacturing telephone apparatus handle only 1.8 tons per man-year.

5.28 These relative volumes of material handled are reflected in the use made of different modes of transport. Extensive use of rail services is confined to the primary industries, the steel-using industries, and some wholesalers reflecting rail's advantage for the transport of bulk materials. Imported supplies to these industries are carried to stocking and processing areas by British Rail or by the firms' own railway or pipeline systems: for example, at least half the 1965 imports of Tees Dock were distributed within Teesside by rail. This dependence on rail is found in the steel and chemical industries; thus ICI Wilton received 780,000 tons of supplies (mainly coal) by rail in 1965 compared with 70,000 tons by road. It applies, too, for shipyards and manufacturers of steelwork which draw at least 80 per cent of their supplies by rail from Teesside steel works. But it is in complete contrast to the third category of industry in which the relative volume of materials handled is small and in which there is complete reliance on road transport.

The national market

5.29 The products and markets of Teesside industry are more diverse than its origins and supplies. Data were obtained from the Manufacturing Survey about the distribution of output from different industries. The response to these questions, supplemented by special interviews, was reasonably good: it covered 90 per cent of total employment in manufacturing industry. Similar information was obtained from a sample covering all the largest firms in warehousing and related distributive trades covering 38 per cent of employment in these categories.

5.30 The data from these sources are summarised in table 5.5. As each firm used a different basis of measurement of output, a standardised measure was used in terms of employment; that is, employment in each firm was allocated to each of the markets in the same proportion as deliveries to that market whether measured by tonnage, volume or value, though tonnage was used where possible. This tends therefore, to over-estimate the relative importance of firms where the ratio of value to weight is comparatively high; these firms are likely to emphasise the importance of fast and reliable transport for their products. The procedure involves a crude simplification so that data for different firms can be grouped together; this applies particularly for TIG 4 and 77.

5.31 The main feature of table 5.5 is the absolute importance of that part of Great Britain lying south of Teesside as the main market, taking 56 per cent of trade. It is relatively most important, too, in the most recently established industries on Teesside, including chemicals, and the post-war group of textiles, clothing and telephone apparatus. Deliveries to the north of Teesside are, perhaps surprisingly low: the area includes the North East, Cumberland and Scotland. Nevertheless, this direction of trade is of greater importance than deliveries within wider Teesside because of the relative importance of steel deliveries to the North East.

5.32 The data establish the importance of the United Kingdom market, especially that to the south of Teesside. A more detailed presentation of data is possible for the deliveries from five large works in the steel and chemical industries which together include 57 per cent of manufacturing employment on Teesside (see table 5.6). The

Table 6.5 Markets of Teesside manufactures and services, 1966

			employment attributable to markets							
Teesplan Industrial Group	total employment June 1965	employment analysed in table	Wider Teesside	per cent	North	per cent	South	per cent	exports	per cent
1. chemicals	33,070	32,400	1,700	5	3,100	10	21,100	65	6,600	20
2. metals	31,030	29 610	3,500	12	6,700	22	16,000	54	3,600	12
3. engineering and shipbuilding	18,250	13,000	2,500	19	1,300	10	4,200	32	5,100	39
21 shipbuilding	4,080	4,090	300	6	0	–	300	6	3,600	88
22 heavy engineering	9,770	7,690	1,700	22	1,000	14	3,500	45	1,500	19
22, 23 miscellaneous engineering	2,390	1,220	500	42	200	17	500	37	0	3
4 other manufactures	17,760	13,600	3,200	24	1,700	12	8,500	62	200	1
36 building materials	2,340	1,680	600	38	300	18	700	42	0	–
37 timber	1,210	1,170	200	16	200	14	800	69	0	–
34, 35, 39, 40 Textiles, clothing, telephones	5,860	5,590	200	4	400	8	4,900	87	100	1
32–3, 41 wire, miscellaneous metal goods, others	5,280	2,530	700	27	400	18	1,300	51	100	4
31 baking	1,990	1,830	1,000	56	300	15	600	31	0	–
38 printing	1,090	790	400	58	100	10	300	33	0	–
sub-total, TIG's 1–4	98,100	88,810	10,800	12	12,700	14	49,700	56	15,400	17
77. wholesale distribution	3,830	1,470	840	57	250	17	370	25	10	1
wholesalers		750	480	62	150	20	140	18		–
coal, builders' merchants		200	140	70	20	9	40	21	0	–
metal merchants		340	140	40	50	17	140	40	10	3
oil storage		180	100	56	30	15	50	29	0	–

Sources: Ministry of Labour employment returns, June 1965; Manufacturing Survey (E S 2); Warehousing Survey (E S 3)

Notes: unit of analysis is the individual firm registered as a separate company. Thus ICI is a single firm, but the subsidiaries of the then Dorman Long group or the Head Wrightson group are separate firms. Sales within the same firm on Teesside are excluded, sales to establishments within the same firm outside Teesside are included;
Wider Teesside is the Teesside Survey Area, Darlington and Hartlepool Employment Exchange areas;
North and South are all areas of the United Kingdom respectively north and south of the latitude of Teesside;
exports includes goods shipped directly through all United Kingdom ports to foreign destinations and all foreign deliveries of ships and ship repair work;
method of attribution of employment to different markets is *pro rata* with the distribution of output measured in tons, where possible, or by value.

Table 6.6. Regional destinations of deliveries from steel and chemical works, Teesside, 1966

	percentage of deliveries, by tonnage				
Standard Region	ICI Wilton	ICI Billingham	Dorman Long (Steel)	South Durham Steel & Iron	Skinningrove Iron
Wider Teesside	5	24	16	2	8
rest of Northern Region	4		12	27	26
East and West Ridings	24		10	14	20
North West	26		9	13	18
West Midlands	12	31	14	21	11
East Midlands	5		4	5	
London and South East, Southern and Eastern	9	27	16	10	11
South West	5	16	8	2	2
Wales	3	–			
Scotland	9	–	10	7	9
Northern Ireland	–	–	2	–	–
TOTAL (rounded)	100	100	100	100	100
Employment, September 1965	13,900	17,400	17,160	9,000	2,500

Source: Manufacturing Survey (E.S 2);

Notes: deliveries by firms between their works on Teesside are excluded;
deliveries to other Standard Regions, excludes pipeline deliveries to Teesport;
ICI Wilton includes exports through ports in other Standard Regions, excludes pipeline deliveries to Teesport,
ICI Billingham only includes Agricultural Division production, and excludes the relatively small production of other Divisions at the works;
Dorman Long (Steel) includes deliveries to associated companies' plant on Teesside; deliveries to South West England, central and north Wales are included in the West Midlands and North West Standard Regions;
South Durham Steel and Iron includes deliveries from Cargo Fleet and West Hartlepool works, but excludes deliveries to or from Malleable works, Stockton.

general pattern is that Lancashire and Yorkshire are clearly very important markets. This is partly because of the deliveries of man-made fibres and other products from ICI Wilton to other ICI works and the textile industry of Lancashire and Yorkshire. Large quantities of fertiliser are despatched from ICI Billingham which, together with the Severnside works of the Agricultural Division, supplies farms throughout the United Kingdom. The markets for building materials and petrol from ICI Billingham lie mainly in the North East. Finally, significant quantities of industrial chemical products are delivered throughout the country.

5.33 In the steel industry, the largest firm Dorman Long (Steel), consigns significant quantities to all parts of the country. Deliveries from the other two firms are relatively more important to the North East and Yorkshire. The Benson Committee forecast that by 1975 the Northern Region and Scotland would provide 7 and 8 per cent respectively of the demand for finished steel but that London and the South East would provide 15 per cent and the Midlands, 24 per cent. The attractions of a location for a major integrated steel works near the South East market were considered by the Benson Committee, including the possible influence of entry to the Common Market, but a location such as Thamesside was not considered appropriate.

5.34 The regional location of markets for engineering products fluctuates from year to year, mainly because much of the output is in the form of 'one-off' products such as contracts for the supply of a power station or new steel-making plant. There is some evidence that the location of potential supplies does influence the placing of these contracts but the influence is not predictable.

5.35 The largest single group of jobs in Other Manufactures is in new firms in textiles, clothing and telephone apparatus. These are nearly all branch factories whose output is consigned to the parent factory for further manufacture or distribution. These parent factories are largely in the West Riding, Midlands and Lancashire.

5.36 The conclusion from this analysis is that the future growth of the Teesside economy does not greatly depend on future developments in the rest of the Northern Region or Scotland as these markets are relatively unimportant. Nor does the Teesside economy depend heavily on other regions whose economies are weak; its strongest links are with Lancashire, Yorkshire and the Midlands.

The local market

5.37 The amount of trade between different industries on Teesside can be illustrated by comparing deliveries between, say, the chemical and metal industries These show that historically the local manufacture of heavy steel has led to the establishment in the area of heavy steel-using industries, particularly shipbuilding and industrial plant and steelwork Equally, a very large part of Teesside's production of industrial plant is for the national steel and chemical industries Thus there is a close technological association between firms in these three industries that offers the advantages, say, of a common pool of trained draughtsmen and technical knowledge. However, this association does not necessarily imply direct commercial interdependence or that growth in employment in different industries is causally related.

5.38 Indeed, this picture of inter-industry linkage is to some extent misleading, it is a case, frequently, of vertical linkage between different activities in a single firm. Dorman Long (Steel) produce coke and chemical by-products and have their fabrication departments. The ICI works at Wilton is a petro-chemical complex, housing five Divisions: Heavy Organic Chemicals, Mond, Plastics, Fibres and Dyestuffs, and a system of pipelines under the river Tees links the ICI works at Billingham, the North Tees oil refinery, Wilton and Teesport. However, deliveries between different works belonging to a single firm are excluded from table 5.6.

5.39 The most important deliveries by firms within Wider Teesside are those from the steel industry. Thus, in 1965, Dorman Long (Steel) supplied 213,000 tons, or 16 per cent of their output of pig iron, steel and ferromanganese to works on Teesside including their own engineering subsidiaries. Deliveries to the Tees shipyards by Dorman Long (Steel) and South Durham Steel and Iron amounted to 45,000 tons, and in future a greater exchange of products is likely between the constituent companies of the Northern and Tubes Group of the British Steel Corporation.

5.40 Local sales of chemical products are less important. Thus ICI Wilton made deliveries in 1965 of 29,000 tons of output of which the largest single item was 10,000 tons of alkathene to British Visqueen Ltd, which is financially associated with ICI and is the only significant manufacturing company on Teesside that uses Wilton products.

5.41 About 20 per cent of the sales of Engineering and Shipbuilding were to local industries. Heavy investment in industrial plant for the chemical industry was the main source of this demand: its manufacture largely occupies a leading firm in the Head Wrightson group, took 30–40 per cent of the 1965 output of Ashmore, Benson Pease & Co. Ltd., and is important in the design work of the Power Gas Corporation at Stockton. However, the investment in new chemical plant is cyclical and is expected to decline after its recent very high levels: in any case, the specific requirements for new plant frequently show a reliance on American designs

5.42 The local Teesside market is important for two other manufacturing activities, taking more than half of the output of baking and printing and publishing But these activities tend to be closely related to the total size of the local market The local market is important, though to a lesser degree, for the sales of building materials and miscellaneous engineering, partly to major Teesside works.

5.43 The major conclusion from this analysis therefore is that no single manufacturing industry on Teesside depends heavily for its prospects on the future growth of existing industries in the area. The two largest, steel and chemicals, draw their supplies from and dispose of their finished products mostly to areas outside Teesside There has been a growth of engineering firms on Teesside around the nucleus of the local steel industry although the latter forms only a small part of the market for engineering products There are no signs of a similar, permanent relationship developing with the chemical industry. The only clear cases of inter-industry linkage therefore are the oil installations and plant for the supply of oxygen at Teesport, serving the demands of the chemical and steel industries; and the several firms engaged in the recovery of waste products from the steel industry including the manufacture of basic slag, road materials, insulation materials and fertilisers. These specific cases of physical linkage create a limited additional demand for land for factories near steel works and the river.

Table 5.7. Export trade of the Northern Region, 1966 ('000' tons)

port of shipment	Teesside	Tyneside	remainder	total
Teesside	762	19	100	882
Newcastle	8	137	48	193
Sunderland	1	23	2	26
sub-total	771	179	150	1,100
Humberside	35	5	41	81
Merseyside	94	59	53	207
Manchester and North West	16	4	36	56
London	28	19	12	59
other seaports	1	5	16	22
airports	0	1	2	3
sub-total	174	93	161	428
TOTAL	945	272	311	1,528

Source: Ministry of Transport, *Portbury*, H.M.S.O. 1966

Notes: data relates to all foreign dry cargo trade, excluding coal, that originates in the Northern Standard Region; Teesside is identified as 'other North East' in Annex 4 of the Portbury report.

Exports

5.44 The direct export of goods manufactured on Teesside accounts for 17 per cent of the total output. By far the greater part of this trade is in chemicals (40 per cent) and in metals (25 per cent) whereas comparatively little comes from other manufactures. The total tonnage of exports from Teesside in 1965 was about one million tons, excluding oil, and about 81 per cent of this trade was exported via the river Tees. The remainder is shipped through several ports of which the most important are Liverpool, Hull, London and Manchester. Newcastle is of very slight importance, as table 5.7 shows.

5.45 Nearly all of the export of bulk materials from the steel and chemical industries is via the river Tees. But amongst the smaller firms, fourteen of the thirty-nine which are exporters use ports other than Teesside for most of their trade. Nearly all these firms produce goods whose value is high in relation to the weight and for which transport costs are low. Their consignments of goods for export are irregular and they use whichever port offers the best service at the required time.

5.46 Conversely, more than 80 per cent of the tonnage of goods exported via the river Tees has its origin on Teesside (see table 5.8). The same source shows that about two-thirds of the general cargo trade exported from the river Tees is produced from areas beyond Teesside. In these circumstances, it is reasonable to use an analysis of the annual returns of trade through the river Tees as a basis for understanding the export trade of Teesside, particularly that relating to the exports of the steel and chemical industries. The average annual trade of the river Tees for the years 1964–66 is shown in tables 5.4 and 5.5. It will be seen that steel and chemical products accounted for 96 per cent of the foreign exports.

Table 5.8. Export trade, river Tees, 1966 ('000' tons)

Standard Region of origin	
Teesside	762
remainder Northern Region	120
sub-total	882
South West	40
East and West Ridings	17
North West	15
Midlands	4
other regions	6
sub-total	82
TOTAL	964

Source: Ministry of Transport, *Portbury*, H.M.S.O. 1966

Note: data relates to all foreign dry cargo trade, excluding coal.

5.47 The biggest single category of exports was iron and steel manufactures, at about 510,000 tons per annum. This is a lower level than had been exported in, say, 1960–62 when it was 634,000 tons per annum. The drop mainly reflects the emergence of a world-wide surplus of steel producing capacity due to increased output in the new producing countries. The Benson Committee and the special report on *Development in the Iron and Steel Industry* by the Iron and Steel Board, 1964, both agreed that there could be no great increase in total British exports of steel, and these views broadly hold. There would be no appreciable loss from possible entry into the Common Market and there may be increases in trade between European steel making countries. But Commonwealth trade is likely to show further problems due to growth of overseas domestic production. These limitations to further growth may apply on Teesside.

5.48 Import substitution is also possible among present overseas customers for Teesside chemicals. ICI Billingham exports a large volume of chemical fertiliser to India and other developing countries. But at the end of 1965, the Indian Minister for Chemicals and Petroleum announced plans for achieving a greater measure of self-reliance in these industries (*Chemical Age*, monthly journal): and in April, 1966 it was announced that a £30 million fertiliser plant was to be built by an Indian subsidiary of ICI. Another major market for chemicals, especially the products of ICI Wilton, is the Common Market, particularly the Netherlands (as the port of shipment). But the present tariff position makes difficult the export to the Common Market of, say, polythene. Therefore polythene is produced at an ICI plant at Rozenburg near Rotterdam, using liquid ethylene from Wilton. This plant is developing rapidly consistently with ICI statements that the size of the Common Market makes it essential for the company to increase its manufacturing capacity in Europe (*Chemical Age*, various issues).

5.49 Nevertheless, these examples of import substitution must be seen in the context of a steadily increasing demand for several of the most important chemical products and the growing use of subsidiary plant in overseas countries is complementary to investment in the United Kingdom. Thus a major part of the new capacity for the production of 300,000 tons per annum of fertiliser at ICI Billingham is intended for export, and production of plastics at ICI Wilton is likely to increase very substantially. But it remains true that British entry into the Common Market would add a further stimulus to the Teesside chemical industry.

Trade of the river Tees

5.50 The facilities of the river Tees reflect this industrial structure. Two-thirds of the total tonnage imported and exported to the river Tees is shipped over private industrial wharves in the ownership of the steel and chemical industries; only a third is shipped through the public docks of the former Tees Conservancy Commission, now owned by the Tees and Hartlepool Port Authority, and several other general cargo docks (see table 5.9). This factor is of fundamental importance for the geographical pattern of heavy industry on Teesside.

Table 5.9. Total trade, river Tees, 1965 ('000' tons)

	imports	exports
Tees Conservancy Commission		
Tees Dock	136	290
Teesport oil jetties	1,469	107
others		
Industrial wharves	5,547	929
Middlesbrough Dock	277	348
Tyne-Tees Wharf	123	323
Stockton Quay	33	31
TOTAL (rounded)	7,585	2,028

Source: Tees Conservancy Commission (now Tees and Hartlepool Port Authority).

Note: industrial wharves are privately owned, mainly by firms in the steel and chemical industries.

5.51 The estuary of the river Tees has admirable natural advantages as it faces North West Europe and is of such a nature that it is possible to build tidal docks on it. Tees Dock, in fact, has the only entirely new deep water general cargo berths to have been built in the country since the early 1930's. Five berths are already in operation with a limiting depth of 30 feet, though a greater depth is possible with dredging. Container facilities are available at the dock.

5.52 Middlesbrough Dock, the other main general cargo dock, is an enclosed dock with eight berths, a limiting depth of about 29 feet and a short entrance lock. It is old and has poor access by road.

5.53 The future development of the river Tees has three aspects. The first is that as Middlesbrough Dock suffers from serious disadvantages, there would be benefit from concentrating its traffic on more modern facilities (National Ports Council, *Port Development, an Interim Plan*, 1965). To do this, further development could be undertaken at Tees Dock, to provide an additional four berths at a cost of about £5 million. Tees Dock would then be a comparatively low cost development and should be capable of vigorous growth which would be likely to leave Middlesbrough Dock surplus to requirements by about 1975.

5.54 The second aspect is that land at Bran Sands, on the south bank, is in the ownership of the steel industry though ICI owns an access corridor across the Sands to the deep water channel.

5.55 Thirdly, if further port development were required, reclaimable land would be available at Seal Sands, on the north bank where a 1,500 foot diameter turning circle has already been constructed. At present vessels of 65,000 tons can use the river upstream as far as Tees Dock. The further developments could take much larger vessels.

5.56 The other aspect of the river is the degree to which it is used by other parts of the country. The report on *Portbury*, giving the reasons for the Minister of Transport's decision not to authorise the construction of a new dock at Portbury, Bristol (H.M.S.O., 1966), contains an analysis and forecast of the traffic through British ports. This showed that in 1964, imported dry cargoes (excluding iron ore) at Teesside amounted to 1.2 million tons of which 52 per cent was distributed within a 25

Table 5.10. Deliveries by main Teesside works, 1965 (percentage of total sales)

Minimum List Heading (S.I.C., 1958)	ICI Billingham	Dorman Long (Steel)	South Durham Steel and Iron	Skinningrove Iron	Head Wrightson Group	average
001 agriculture	54					17
101 coal mining		5	2	26	} 9	3
102–9 other mining						*
261–7 chemicals, oil		*	*		22	15
311–2 iron and steel		7	1	1	33	5
313 iron foundries		*	*			*
341 industrial plant, steelwork		37	24	25		13
331–9, 342–52 other mechanical engineering		4	2	10	17	3
361–9 electrical engineering		1		11		*
370 shipbuilding		2	3			1
381–2, 389 motor vehicles		3	*			1
384–5 railway equipment		1	1			*
394 wire		9				3
391–3, 395–9 miscellaneous metal goods		1	*			*
411–29 textiles						8
496 plastics						5
500 construction	30	6	19			6
701–9 transport		6	22		14	4
merchants		19	25	25		8
unclassified	16	*		2	6	7
TOTAL (rounded)	100	100	100	100	100	100
total employment, September 1965	17,400	17,150	4,400	2,500	5,200	60,550

Source: Manufacturing Survey (E.S.2).

Notes: ICI Billingham includes exports and relates to Agricultural Division only;
Dorman Long (Steel) excludes 'items for further conversion' and items other than steel;
South Durham Steel and Iron is for sales from Cargo Fleet works excluding sales to other works, sales to transport are for British Rail;
Head Wrightson Group includes exports; includes sales by Seaton Carew works outside Survey Area, data based on value of orders placed, year ending 31st January 1966;
the average column is a rough approximation, calculated in terms of the weighted average employment in sales to each industry *pro rata* with distribution of sales, an estimate for ICI Wilton is included;
*, less than 0.5 per cent.

mile radius of the port (i.e. virtually to Wider Teesside) and a further 37 per cent to destinations between 25 and 50 miles away, virtually the closer parts of the Northern Region.

5.57 The character of the river Tees is quite different from ports such as Tyneside and Hull. Both of these have a substantial volume of general cargo imports including food, drink, and tobacco whereas the river Tees has a much smaller proportion of such trade. In fact Teesside's needs for flour, for instance, are met by flour mills on Tyneside. The Portbury report forecasts an increase in Teesside's general cargo trade by 1980 to about 1.6 million tons

5.58 The exports of the river Tees are even less varied in their origins (see table 5.6). That is, 79 per cent of foreign exports arrive from within 25 miles of the port, and 91 per cent from within 50 miles. However, two-thirds of the general cargo exports excluding steel and chemical products comes from outside Teesside and this may increase with the development of container services. The Portbury report forecasts that dry cargo exports are likely to rise to about 1.3 million tons by 1980.

The future prospects for Teesside products

5.59 The economic prospects for Teesside's industries may further be gauged by considering the nature of their markets as part of the national economy. A rough indication is given in table 5.10 showing the distribution of sales to different sectors of the national economy from five main works and companies on Teesside.

5.60 The chemical industry, on the evidence of ICI, is clearly dependent on technological innovation in farming, textiles and plastics. The supply of man-made fibres and dyestuffs to the textile industry rapidly overtook agriculture between 1953 and 1955 as ICI's leading customer in the home market, although agricultural sales nearly equalled the former from 1965 to 1967 (ICI, *Annual Reports*).

5.61 The nature of the steel industry's markets reflects its specialisation in the production of plates, sections and rails and their use in construction and constructional engineering, mining, shipbuilding and railways. The future prospects of these markets have been assessed by the Benson Committee and are shown in table 5.11.

Table 5.11. Home steel consumption, United Kingdom

industry	percentage of total home consumption, 1965	percentage increase in home consumption, 1965–1975
coal mining	3	−26
industrial plant, steelwork and construction	19	+48
other mechanical engineering	14	+44
electrical engineering	5	+41
shipbuilding	4	−18
motor vehicles	14	+40
railways	3	−20
others	39	+40
TOTAL (rounded)	100	+35

Source: *The Steel Industry*, Stage I report of the Development Co-ordinating Committee, British Iron and Steel Federation, 1966.

5.62 The expected decline in the demand for steel by the coal mining and railway industries is particularly significant for the prospects of Teesside steel works, especially perhaps Skinningrove. Forecasts of an increased demand from the construction industry and industrial plant manufacturers are difficult to assess especially in view of the concern expressed by Teesside steel manufacturers about the expected substitution of pre-stressed concrete for structural steel. But a large part of the forecast national increase in demand is from mechanical and electrical engineering and motor vehicles, for all of which Teesside production is low. The most rapid national growth in production is expected to be for sheet, tinplate and tubes. Only the last of these is produced on Teesside, by South Durham Steel and Iron at their Malleable works, Stockton and in a new capacity at their Greatham works, West Hartlepool.

5.63 The effects of changes since 1956 in the level of production of the steel industry have been felt in the local manufacture of industrial plant and steelwork. Thus one-third of the orders received in 1955 by the Head Wrightson group were still from the steel industry but the Chairman, in a recent annual report, has described 'reliance on the steel industry as likely to be unwise with its great fluctuations in demand' and quotes growing prospects from increased diversification into plant for chemicals, earth moving and harbour equipment. These orders, however, were not reflected in table 5.10 which was for 1965.

5.64 Estimates of the effects of these various prospects on employment are discussed in later chapters of the report. In general, however, prospects are best in the most recently formed industries (e.g. plastics, telephone apparatus) and worst in the oldest sectors which manufacture, for instance, heavy steel products. The weight of post-war investment in new growing industries is considerable, but continued diversification is actually important, both by the introduction of new firms and by changes in existing firms. Too much of the area's industry relies upon markets whose future is doubtful either because of new, competing products or because of import substitution by overseas countries.

The changing location of Teesside industry

Physical characteristics of Teesside's industry

5.65 This analysis of the trading basis of the Teesside economy points the way to a more sophisticated classification of its industries based upon their significance for land use and transportation planning. The basic division must be between heavy and light industry, with the former accounting for the entire industrial use of the river and rail transport, and for all local, physical linkages between different industries. These heavy industries are all large users of land and this, together with their need to minimise the costs of transport between plants and between plant and wharves, means that these must continue to be located along the lower reaches of the river Tees. In contrast, the light industries in general have comparatively few physical characteristics that must determine their locational pattern other than that of ease of access by road for their materials, products and manpower.

5.66 Each of the two basic sectors can be further subdivided to give a fourfold classification of industry (table 5.12).

a *Heavy processing industries* include all the heavy processing industries handling more than 100 tons of materials per man-year, that is, chemicals, iron and steel, building materials and timber. They are responsible for nearly all imports of raw materials whether over industrial wharves, public docks on the river Tees or, in the case of timber, through Hartlepool and Whitby. The

Table 5.12. Classification of manufacturing industry by physical characteristics

Industry	Teesplan Industrial Groups	employment, 1965
heavy industry:		
(a) heavy processing	01–03, 11, 36–37	63,800
(b) steel-using	12–3, 21–3, 32–3	22,100
light industry:		
(c) general light	34–5, 39–41	9,200
(d) market oriented	31, 38	3,100
TOTAL (rounded)		98,100

Source. Ministry of Labour employment returns

Note: a simpler classification is used in Volume I (table 3.38), based on the nine Teesplan Industrial Groups, rather than the forty-one sub-groups.

only major inland sources of supply are the coal, coke and limestone carried by rail from Durham. Most of their output is carried by rail or sea although deliveries are increasingly being carried by road. Primary industry also accounts for all the local use of the rail system and pipelines.

b *Steel-using industries* include foundries, industrial plant and steelwork, shipbuilding, wire and miscellaneous metal goods manufacture. The larger firms in this group rely on rail transport for their steel supplies and are found in relatively close proximity to the primary industries or the riverside belt of rail connected sites.

c *General light industries* include a distinctive set of firms established on Teesside since the 1930's, largely as a consequence of Government policy. They make negligible use of Teesside raw materials or products, the port or railway system. They are heavily oriented to southward sources of supply and markets and their foreign trade, where it exists, is only fortuitously and occasionally via the river Tees. They are light industries in the sense that the value of their products is usually more than £400 per ton and they handle less than 10 tons of materials per man-year. Their lower transport costs gives them a relatively free choice of location.

d *The market oriented industries* are baking and printing, employing about 3,100 workers serving the local Teesside market.

Post-war movement of industry on Teesside

5.67 One-quarter of the 200 manufacturing establishments employing more than ten people on Teesside in 1965 were located on a fresh site since 1950: thirty-five establishments had moved from an old to a new site on Teesside and twenty-one establishments were new to the area since 1950. The details of these changes are given in table 5.13.

5.68 A total of about 12,550 jobs in September, 1965 were in establishments in a new location since 1950. Three-quarters of these were in relocated establishments but no general conclusion can be drawn about future rates of relocation. It will be shown in the next sections that many of these relocations were major shifts by heavy industry that are unlikely to recur.

5.69 The movement to Teesside of new establishments in heavy industry is almost entirely associated with local sources of supply, local markets and financial linkages together with the availability of port facilities. The major examples are usually an ancillary of the steel and chemical industries, including British Oxygen Ltd., British Visqueen Ltd., and, in a different category, Ready Mixed Concrete Ltd. The availability of labour and Government inducements were of secondary significance in attracting these firms to Teesside.

5.70 By contrast, it was the availability of sites and a labour supply and Government inducements that attracted most of the light industry to Teesside. The firms include particularly manufactures in electrical engineering, clothing and textiles located on Board of Trade industrial estates founded since the war. This is an entirely new type of activity for Teesside: it is a relatively 'footloose' type of industry with very little integration with the rest of the Teesside economy. It has been largely a female employing activity.

Table 5.13. Manufacturing establishments relocated on, or moved to Teesside, 1950–65

	heavy industry		light industry		
	heavy processing	steel using	general light	market oriented	total
relocations					
number of establishments	8	16	1	10	35
employment, 1965	5,780	2,130	30	1,340	9,280
firms new to Teesside:					
number of establishments	8	3	8	2	21
employment, 1965	940	310	1,580	430	3,260
number of establishments giving the following reasons for moving to Teesside:					
supply of male, skilled labour		1			1
supply of male, unskilled labour		1			1
supply of female, skilled labour			2		2
supply of female, unskilled labour			6		6
availability of sites or premises	5	2	7	2	16
availability of port facilities	3	1			4
availability of regional market	8	1	2	2	13
availability of regional supplies	5	1	1		7
associated companies in region	4	1		1	6
Government inducement: grants and loans	1	1	4	1	7
Government inducement: rented premises			4	1	5
total employment involved in moves	6,730	2,440	1,610	1,770	12,550
total Teesside employment in industrial group	63,800	22,100	9,200	3,100	98,200
percentage of Teesside employment involved in moves	11	11	18	58	13

Source: Manufacturing Survey (E S 2).

Notes: firms usually give more than one reason for moving;
'region' means Teesside and North East;
data relates to moves made before December 1965; it includes two moves for which recruitment had barely started (Sirfield Ltd., at Urley Nook, making car components; K. C. Ellis Ltd., at Eaglescliffe, making plastic goods).

5.71 The distinct functional characteristics of new factories in heavy and light industry are reflected in their locations. The principle relocations have been in steel and steelwork, located within the riverside belt, near the main railways. The largest have been the development of Lackenby Steel Works and the new engineering works at Yarm Road, Stockton, of Ashmore, Benson Pease & Co. Ltd. Smaller developments in heavy industry have been in the same general locations, including slag, oil and oxygen processing at South Bank and Tees Dock, and chemicals and concrete production at Yarm Road and Eaglescliffe.

5.72 Yarm Road and Eaglescliffe has also been one of several areas developed for light industry, the other main locations being at Portrack Lane, Stockton, East Middlesbrough, Skelton, Marske and Redcar. In contrast to heavy industry, light industry has located in areas entirely lacking the rail and sea trading connections of the riverside belt. Apart from the areas already mentioned, light industries have been sited in residential areas at Billingham, Stockton, Eston and Guisborough. It appears that the light industries are much more flexible in their choice of location, thus making them capable of a wider distribution subordinated, where necessary, to the requirements of environmental and traffic planning.

The expansion of heavy industry

5.73 There is a sharp distinction between Teesside's existing heavy industry and the nature of development in light industry whether on Teesside or elsewhere. Study of national examples shows that the local siting of much modern industry can be subordinated to planning standards of traffic and environmental management, given a reasonable supply of land with the prospect of easily providing services. The main exception to this, according to W. F. Luttrell (*Factory Location and Industrial Movement*, 1962) were those industries which were strongly oriented to sources of raw materials, were tied to ports, or in other ways were restricted in their choice of location. Although employing only 2 million people in the country, they include shipbuilding, much of heavy chemicals and oil refining, metal manufacture, some non-metalliferous mining products, and sections of other industries such as flour-milling and paper making. Luttrell showed that movement by industry in these sectors was by no means impossible, but was restricted by the extent to which the siting requirements could physically be met rather than by a direct calculation of transport costs.

5.74 Teesside has nearly all the exceptional industries mentioned by Luttrell. The only exceptions are port-processing industries such as paper making or flour processing which depend on the port having sufficiently large a hinterland. Thus the trading basis of the Teesside economy has depended on a direct and specific need for particular site characteristics. The heavy industries can be described as site-orientated because of their requirement for the following:

river berths for industrial wharves;
use of river or sea water for processing;
use of river or sea for the discharge of effluent;
use of the river for launching purposes;
railway sidings;
mineral deposits;
close proximity to other, linked works.

5.75 Close analysis of the Manufacturing Survey shows that every works in heavy industry on Teesside depends on at least two of these factors. Growth in steel and chemicals has depended on all the factors except launching facilities. By contrast, virtually none of the light industries depend on these factors; the only exceptions are two small factories discharging effluent to the river Tees.

5.76 The following analysis of the prospects for the expansion of heavy industry is thus directed towards establishing the continuing availability of these factors without which further heavy industrial development would not be possible.

The chemical industry

5.77 Teesside has 7 per cent of national employment in the chemical industry and its record of growth justifies the assumption that it will continue to share in the future national growth prospects of the industry. The trading factors that affected the industry's location on Teesside have been the convenient supplies of raw materials by rail and sea, local raw materials, and the recent development of integrated production processes based on imported oil. Integration, however, has been entirely within one company, ICI, rather than between different companies as at Grangemouth. The ICI works at Billingham and Wilton are linked by pipeline with each other and with North Tees oil refinery (jointly owned with Phillips Petroleum), Teesport oil jetties and jetties at Billingham Reach and North Tees. None of the other ten chemical works on Teesside (employing 3,000 workers) is related in its location to proximity with ICI except, possibly, for British Titan Products Ltd., on the riverside at Billingham and making heavy use of river water.

5.78 Luttrell's analysis confirms the importance nationally for the location of chemical works with easy access to raw material imports, large supplies of process water, effluent facilities and, in certain cases, tipping areas for solid waste. There were cases of firms being deterred from estuaries because of heavy water pollution, infirm sub-soil, or the proximity of residential areas. Three factors, however, seem to be dominant in considering the growth of the chemical industry on Teesside: the size of plant; the use of oil imports, and the possible use of natural gas and other raw materials.

5.79 Chemical production has shown an increased trend toward concentration in large plant; thus the influence of individual location factors are dwarfed to insignificance by the major differences in production costs between large and small plants in the petrochemical industry. Economies of scale have affected location decisions by ICI through much of its history. Before the last war the group was expanding quite rapidly but, with one or two exceptions, its policy was to build extensions and new plants adjacent to existing factories, thereby achieving significant economies in the supply of site facilities, process-steam, power-capacity, roads, sidings, drainage and offices. Thus Billingham Works was extended in the 1930's south of the New Road and the site generally was developed to its full capacity.

5.80 The need for heavy investment in building the basic services for virgin sites was generally avoided. Even the development of Wilton Works followed this precedent as the possibility of a short link by pipeline to Billingham was probably the decisive factor in choosing Teesside rather than other alternatives for this large new investment. ICI have since been closing many of their smaller plant, particularly those at inland locations in

Lancashire and Scotland, and concentrating their activities on a few major locations at Ardeer, Runcorn–Widnes, Severnside and Teesside, and major integration between their plant on Teesside and in North West England will follow the completion of their trans-Pennine pipeline.

5.81 This pattern of development reflects, to some extent, the growing dependence on a choice of a coastal location, because of increasing integration between the chemical industry and oil refining. This may be seen, or is soon to be the case at Grangemouth, Ellesmere Port, Carrington, Fawley, Humberside Swansea Bay, Europort or on the Texas Coast. Teesside now falls into this category because of the joint development of North Tees refinery by ICI and Phillips Petroleum which has a capacity of 5 million tons of crude oil per annum.

5.82 The future influence of natural gas is more difficult to analyse. The known finds in the North Sea are to the south of Teesside and the points at which gas is to be brough ashore are in the Humber area, and further south in Norfolk. If successful drilling occurs in the north of the concessional grid, then consideration will be given to further landfalls. It has been suggested that new plant may be attracted to the eastern coastboard to achieve possible economies in utilising any available cheap supplies of natural gas. On present evidence they would firstly be attracted to areas such as the Humberside. But the question is whether any supplies will be available other than through the Gas Council's proposed national grid, at its standard prices, given the present legal and administrative arrangements of the gas industry. Teesside is assured of connection to the national grid by 1970, but this would not give it advantage over any other part of the country.

5.83 The major discoveries by Home Oil Ltd. of natural gas in the North York Moors are of interest to the chemical industry. They proposed to supply gas direct to Teeside Industry, but it is at present understood that the Gas Council will require it to be piped to the national grid instead.

5.84 Discussion of the subject of natural gas by the chemical industry centred not around the establishment of new works, but the conversion of existing ammonia plant at Billingham to use natural gas. In fact, if the composition of natural gas is similar to the Dutch gas-fields, its use in chemicals as a whole will mainly lie in ammonia production (*Chemical Age*). Although natural gas can be used to replace naphtha for hydrogen, methanol, ammonia and fertilisers it cannot replace naphtha as a cracking stock or as a raw material for aromatics. A switch to natural gas for ammonia at Billingham Works will by no means ease the naphtha supply position, or supersede any planned capacity at the North Tees Refinery.

5.85 The other new raw material to be exploited on Teesside is potash. The deposits are in East Cleveland and ICI are proposing to work them by sinking a 4,000 foot mine on a 200 acre site at Boulby near Staithes. The mine is expected to produce between 1.0 and 1.5 million tons per annum which would be sufficient to replace the current level of foreign imports of about 0.7 million tons per annum. The development is expected to provide about 500 jobs in the area, and the expected life of the mine is between twenty and forty years. ICI do not expect any satellite development of linked works to take place in East Cleveland. the potash will probably be transported by rail, if the closed branch line through Staithes can be reopened.

5.86 The conclusion, therefore, is that neither natural gas nor potash is likely to lead to any substantial development of entirely new plant on Teesside although the former will assist in production from existing chemical plant and the latter will provide employment for a time in East Cleveland.

5.87 Known plans for the expansion of chemical production on Teesside centre on the capacity of the two main ICI works, in particular the reserve of land at Wilton and the possibilities for redevelopment at Billingham.

5.88 ICI Wilton now represents a total investment of nearly £200 million, covering 1,000 acres; this leaves a further 1,000 acres of land still capable of development. In addition, an access corridor leads to an undeveloped area of 430 acres of estuary land, of which 280 are below the high tide wall but reclaimable. The rate of investment between 1964 and 1966 has been on average £30 million per annum, twenty projects completed or on hand in 1966 included major plant for nylon polymer, butadiene, ethylene, 'Terylene' polymer and polythene and the latest ethylene plant is the world's largest. The 2,000 acre site has planning permission as a whole, and development is expected to continue in the future.

5.89 ICI Billingham covers 1,100 acres which are intensively developed. Since 1950, there have been fifty plant extensions and a number of other developments including large offices. Capital spending reached a peak of £20 million in 1965, with ten projects completed or in hand in 1966 including major new fertiliser plant for urea and nitram. Agricultural Division recently made a study of long term land needs in the vicinity of Billingham. The conclusion was that existing industrial land could contain development, including further redevelopment, for about five years, but that further land needs were difficult to forecast. Any extension of the plant area could more logically occur in a north-easterly direction, for reasons of internal site layout and proximity to services, rather than in the area to the south, fronting A1130, which was most suitable for packing and ancillary uses.

5.90 Only an exceptional new ICI development would be likely to use its own river access rather than the common services of the existing works. ICI has a very large reserve of land at Cowpen Marshes east of Billingham between the works, the river, and the Hartlepool railway, which is physically capable of industrial development.

5.91 Several other firms have plans, or the capacity, for further expansion of production, particularly in the vicinity of the estuary. Monsanto Chemicals have recently proposed a major development of 100 acres at Seal Sands, on land to be reclaimed on the north bank, for the production of materials for man-made fibres, with an option for the development of a further 130 acres. The site has a river frontage of 1,000 feet on which jetties will be built for importing propylene and ammonia. The development is expected to provide 150 jobs.

5.92 The Shell Refining Company has taken sufficient land to double the site area of their refinery now under construction on a site of 170 acres near Tees Dock. The North Tees Refinery, which occupies a site of 60 acres, has options on a further 60 acres. Sadler & Co. Ltd are redeveloping sites for oil storage near Middlesbrough Dock. Away from the river, A.C.C. Ltd. at Urley Nook are expanding production and ICI (Fibres) Ltd. are equipping a factory on the Skelton industrial estate.

5.93 There is, finally, the question of attracting major new firms in the chemical industry to Teesside, although there are certain limitations on the capacity of Teesside to do this.

a There is very little precedent for new firms being attracted to Teesside by the presence of ICI. Since the development of the production of plastics at Wilton only two plastic using works have been set up on Teesside; one of these is partly owned by ICI and uses Wilton products but the other takes its supplies from Cheshire. Analysis of transport costs in the plastics industry show that it is cheaper to carry plastics materials in bulk to the manufacturers of moulded and fabricated plastic goods sited near the final market. Although the argument appears strong, it would nevertheless be reasonable to reserve land for this type of activity in the vicinity of major works, where possible.

b All the existing river frontage is either developed or retained for development by its present industrial owners; and there is a limit to the further abstraction of river water or the discharge of effluent pending reorganisation of sewerage arrangements for Teesside.

c No land remains available for the development of a major petrochemical complex on the south bank based, for instance, on the Shell refinery. Thus the construction of a fertiliser plant by Shellstar Ltd. had to be at Ellesmere Port, Cheshire, in close proximity to a Shell refinery, partly because insufficient land was available near their Teesside refinery.

5.94 However, the possible adverse effects of these limitations can be offset by the presence of a large area of unreclaimed land on the north bank of the river. Seal Sands covers about 1,750 acres below high water and is the last extensive tract of reclaimable land in the Tees estuary. The Tees Conservancy Commission held powers for their reclamation since 1920 and their successors, the Tees and Hartlepool Port Authority, have outline plans for industrial and port development on the Sands.

5.95 The possible port developments were referred to in paragraph 5.55. Several factors combine to support the view that industrial development is also likely, mainly by the chemical industry:

a surveys show that reclamation would cost about £5,000 per acre;

b reclamation would complete a process which has successfully provided industrial land in the Tees estuary since the Commission was set up, most recently for the two refineries;

c a likely future shortage of berths, possibly for general cargo docks;

d deepwater frontage has increased in importance because of the import of chemical ores and oil and the need to reduce the disposal costs of effluent;

e the river Tees has recently been dredged for 55,000 ton tankers as far as Teesport and the possibility of taking larger vessels has been discussed;

f deepwater estuarial berths adjoining industrial land are sufficiently rare as to represent a regional and national asset; the Tees is one of a small number of eastward facing estuaries capable of providing this facility.

5.96 Tangible evidence comes from a small but continuous series of enquiries by major chemical firms, seeking sites of up to 500 acres in size with the advantages offered by Seal Sands. Many of the enquiries are tentative, but one firm, the Monsanto Chemical Company, has decided to develop at Teesside (see paragraph 5.91).

5.97 However, the industrial development of Seal Sands would raise several planning issues which would have to be resolved:

a the proximity of a proposed nuclear power station at Seaton Carew, on the north side of Greatham channel, close to Seal Sands; it is understood that the safety zones required for the power station and its manner of operation would not affect the industrial development of the Sands;

b the long term supply of water to Teesside (see chapter 21);

c the effect on effluent disposal and the cleanliness of the river Tees;

d the effect on the wild life of Seal Sands and Cowpen Marshes, parts of which are areas of special scientific interest;

e the organisation of development so that the use of the Sands is limited to firms having a particular need for its special facilities including maximum use of the river frontage; the Port Authority's outline plan provides for this so that 600 acres would be reserved for port development and 1,150 acres for industrial development.

5.98 Therefore, a broad area east of Billingham, between A1130, the Hartlepool railway, Greatham Creek and the river Tees should be reserved for heavy industrial development in the urban structure policy; this would probably be mainly developed by the chemical industry. It is suitable for this development, because of its specific attractions. It is a correct policy also because the area has no merit for alternative uses. Environmental standards of housing, and accessibility for light, labour intensive industries are much higher in other parts of Teesside.

5.99 It is likely that the development by 1991 would be for the use of Seal Sands itself and for an extension of ICI Billingham in the Haverton Hill area; it is unlikely that Cowpen Marshes would be developed by this time, or that the Clarence area would finally have gone out of residential use.

5.100 There are several qualifications to this general policy apart from the factors mentioned previously. In particular, heavy processing plant should be sited away from the margins of the area which preferably should be used for packing, storage, stockyards or tipping purposes. This would be to reduce the effects of atmospheric pollution and industrial noise on nearby residential areas. This proviso applies to land adjacent to Billingham industrial estate, Cowpen Bewley and A1130. It also applies to Clarence if this residential area should be cleared and redeveloped for industry.

Metal manufacture

5.101 Teesside, including Hartlepool, accounts for 17 per cent of national steel production, a total of 3.6 million tons in 1955 (table 5.14). The area has been made headquarters for the Northern and Tubes Group of the British Steel Corporation. It is well placed geographically for future expansion and the steel industry owns sufficient land to meet possible future requirements. The Corporation had not published its proposals for the future development of the Northern and Tubes Group at the time of writing this report. The following analysis is based on existing trends developments and reports, as interpreted by Teesside Survey & Plan.

5.102 Production rather than marketing factors are the determining factors in the location of the steel industry. The production of Teesside steel involves bringing together large volumes of raw materials at points con-

Table 5.14. Production of crude steel and pig iron, 1966 ('000' tons)

company	pig iron	steel products	main products
Dorman Long (Steel)	1,533	1,915	beams, rails, plate
South Durham Steel and Iron	1,004	1,430	rails, plate, heavy sections, bars
Skinningrove Iron	158	256	rails, axles, sections, bars
TOTAL	2,695	3,601	

Note: South Durham Steel and Iron includes Cargo Fleet and Greatham Works, West Hartlepool.

veniently sited for bulk transport methods. Raw materials from inland sources, mainly coal and limestone, have a fairly uniform price at all points on the rail and water transport systems within Teesside. But imported supplies of iron ore are at their cheapest at the wharves where they are discharged. This means that a site adjacent to navigable stretches of the river is the most advantageous for steel processing. This type of location is also best for the despatch of finished products. Although the total weight of outgoing products, excluding waste and slag, is much less than that of the raw materials, the cost of their transport is considerable, especially products such as large, structural steel shapes which are for export.

S.103 An annual average of 3.1 million tons of iron ore was imported via the river Tees between 1964 and 1966. The riverside location of Teesside steel works helps keep the costs of handling these imports to a minimum and must continue to do so, though not necessarily at the wharves currently in use. The same need to avoid re-handling of goods applies at intermediate stages of manufacture, leading to the close linkage of adjacent plant wherever possible by rail, pipeline and conveyor belt.

5.104 Production has therefore concentrated on two main groups of plant at South Bank and at Hartlepool outside the survey area. Each group has its own rail siding and the former also has its own wharves on the river. This process of concentration has occurred mainly since the war, replacing the capacity lost by the closure of old, smaller works including Clarence works, Port Clarence; Bowesfield Lane works, Stockton; Normanby ironworks; and Newport works, Acklam works and Gjers Mills, at the Ironmasters District, Middlesbrough.

5.105 The works belonging to Dorman Long (Steel) in order of size, are the Cleveland and Lackenby works, South Bank; Redcar works; and Britannia works at Ironmasters. Following the closure of their iron mines at East Cleveland in 1964, and their Redcar and Britannia wharves, their main supply of iron ore is obtained through their South Bank wharves, opened in 1949. The Cleveland and Lackenby works are linked by rail and pipeline.

S.106 The other large works at South Bank is the Cargo Fleet works, headquarters of South Durham Steel and Iron, now part of the Northern and Tubes Group. This company also operates the new Greatham works at Hartlepool and imports iron ore through West Hartlepool and their own wharves at Cargo Fleet. The third company on Teesside controlled by the British Steel Corporation is Skinningrove Iron in East Cleveland, which is now supplied entirely by rail.

5.107 In the short term, it is possible for the Corporation only to re-organise the use of existing capacity, for example by a greater linkage between Cargo Fleet, Cleveland and Lackenby works. Rationalisation involving the construction of major new plant will be a much longer term operation. The future development of the steel industry on Teesside can be discussed under three headings, the continuing effects of economies of scale; future use of the river; and the possible effects of natural gas.

5.108 The potential capacity of production of Dorman Long (Steel) and South Durham Steel and Iron respectively in 1965 was put at 2.6 and 2.0 million tons of crude steel per year (*Development in the Iron and Steel Industry*, Iron and Steel Board, 1964). The Benson Committee of 1966 gave a close analysis of technological factors influencing the likely 1975 pattern of steel production. It concluded that the sizes of secondary mills were critical in determining the scale of integrated works. To achieve economic production in modern plant of the best design, an integrated multiproduct works must have a capacity of at least 3 million tons per annum, and the Report recommends a capacity of 3.5 million to 5 million ingot tons per annum as the target size for integrated works in the mid-1970's. For non-integrated works the Committee recommended a range of 1 to 1.5 million tons. The introduction of computers and automatic control equipment could well improve management control to the point where the operation of still larger works would become feasible and this point is now recognised.

5.109 Capacity of the two main Teesside firms, taken separately, is therefore below optimum levels and it therefore seems likely that the process of integration and concentration which has occurred since the war will proceed further. But the Benson Committee considered that, in general, new facilities should normally be provided by way of extensions at well placed existing sites rather than by the construction of new 'greenfield site' works. This was recommended because of the cost of providing completely new services at new sites; because of the cost of providing all the units of plant along the full, integrated chain of production; and because of the longer construction and running-in times likely to occur at a brand new works. Finally, the Benson Committee argued against greenfield sites explicitly because of the social costs 'which ought to be borne in mind if there is any question of closing down an existing site and developing in a new location'.

S.100 In this situation, the Committee took the view that rationalisation would be helped by setting up groups of companies that linked works with a high growth potential and those with only a limited life. The establishment of the Northern and Tubes Group of the British Steel Corporation is, in fact, a geographical grouping with these characteristics as far as Teesside is concerned (*Report on Organisation*, British Steel Corporation, H.M.S.O., 1967). It is expected to facilitate the development of larger works and larger plant units in close proximity to smaller works, with a limited life. In this way, the social problems associated with closures would be eased.

5.111 The increased importance of economies of scale in this thinking clearly implies further closure of small works. This is explicitly expected by the steel industry in general and by various towns in the country which may be affected. It is true that the Benson Committee stressed that the importance of capital costs to the industry means that older steelworks may survive for a long time. The local steel industry has stressed the value of some of their older and smaller works for the production of special goods and short runs. In all the circumstances, it seems reasonable to assume that, by 1991, separate works with a capacity of less than 1 million tons per annum will probably have closed. These could include Skinningrove, whose markets are likely to decline; Britannia, at Middlesbrough; and the existing works at Warrenby, Redcar. In addition, it is possible that the tube making plant at Malleable Works, Stockton, might be replaced by the new capacity at Greatham Works. These are purely the views of Teesside Survey & Plan.

5.112 It is clear from the analysis so far that the new integration of large new groups of plant must proceed from the basis of existing investment. But the Benson Committee also identified easy access to deepwater for the import of coal as the most important factor determining the location of an integrated works. Precedents may be quoted from American experience and current developments in Western Europe, at Bremen, Ijmuiden, Dunkirk, Taranto and Ghent.

6.113 In 1965, South Bank wharves group was one of several in the country with a capacity to take vessels carrying cargos of 21,000 tons; the others were at Glasgow and Newport, and the Tyne ore quay had a capacity of 33,000 tons But it will probably become policy that the greater part of ore imports in the mid-1970's should be carried in 60–65,000 ton ore carriers.

6.114 The economic advantages of using bulk carriers have become increasingly evident over the past few years and have been the subject of detailed consultation between the steel industry and the National Ports Council. For commercial reasons the steel industry's fleet must contain ships large enough to make imports from the more distant sources a more economic proposition though several complex economic and physical factors are involved in calculating the optimum size of vessel, including the number of ore-shipping countries with deepwater berths at any time. The bulk of the potential savings from increased size would result from the use of ships of up to 65,000 tons and the major immediate savings from developing ports for these vessels would be in South Wales. Firm plans therefore exist for the development of Port Talbot and Newport to take vessels of at least 66,000 tons and if necessary up to 100,000 tons, the capacity recommended by the National Ports Council for any new terminal.

6.115 Study showed that it would not be economic at the present stage to develop either the Clyde or the Tees for use by the steel industry alone. Large ore carriers could be accepted in the Tees only if dredging were carried out and the cost shared with some other user, and this is what has happened. The Port Authority has completed extensive dredging to enable oil tankers of up to 63,000 tons to be accommodated at Teesport and this channel could feasibly be extended to the ore quay at South Bank. Also the Tees is one of several estuaries which could be dredged to take vessels of 100,000 ton, though not necessarily to South Bank wharves. The Tees and Hartlepool Port Authority have proposals to provide for 100,000 ton oil tankers, and even 200,000 ton vessels. In the latter case at least it is clear that facilities would have to be provided as near the sea as possible. Comparison of the size of ore carriers with that of oil tankers is misleading, as the tankers require much less sophisticated discharging facilities, involving simply mooring facilities at sea with a pipeline to storage tanks. This is in contrast to the cranes, stocking and forwarding facilities required for ore. Dorman Long (Steel) have nonetheless looked forward to the future reception of vessels of 100,000 tons, in visualising deepwater berths for handling ore at the mouth of the river (Evidence of the Chief Engineer of Dorman Long (Steel) to the House of Lords Select Committee on the Tees Valley and Cleveland Water Board Bill).

6.116 The Benson Committee therefore concluded that the five most favoured areas for integrated works, by reason of the availability of deepwater ports for the 1970's were: South Wales, North Lincolnshire, Teesside, Deeside and the Clyde. On grounds of access to regional, national and European markets the Committee concluded that North Lincolnshire, Teesside and South Wales were the most suitable growth centres and recommended that Teesside should have 'two or one' works with a capacity in excess of 6 million tons. Proposals or ideas for growth on Teesside already existed and the Benson Committee envisaged that the two works proposed for the area would take advantage of their proximity to co-ordinated production facilities to a stage at which the two works are virtually a single complex. That is, the two works at Greatham and South Bank, either taken separately or together.

6.117 The last of the three factors is the use of natural gas. The Benson Committee did not see its use offering any long term advantage to Teesside compared with North Lincolnshire or South Wales. At the right price, it could be substituted extensively for other fuels, especially heavy fuel oil, and its low sulphur content also would make it an attractive fuel. But any local advantage to Teesside or North Lincolnshire would depend on the pricing policy for gas and the method of distribution

5.118 From the basic logic of the Benson Report and later thought, it is possible to draw conclusions about the likely future expansion of steel production on Teesside, distinguishing between short term proposals for the period to 1976, and more tentative ideas for the longer term. The most important recent development was the merger of South Durham, Dorman Long and Stewarts & Lloyds, and their proposal to establish new steel pipe making plants at Greatham, supported by the plate mills of both Greatham and Lackenby to meet the pressing need for steel pipes. The proposal was prepared before, and has been completed since nationalisation.

6.119 Greatham Works is outside the Survey Area and draws few workers from it. With its recent foundation, open location and capacity for tube production, Greatham is showing the faster rate of growth, but the South Bank complex, including Lackenby, provides greater present economies of scale. In July, 1967, Dorman Long (Steel) announced they would build a basic oxygen steel plant at a cost of £16.4 million, thus completing Stage V of their post-war development programme at a total cost of £140 million. The new plant, to be brought into use by 1971 will, when added to existing capacity, provide the Northern and Tubes Group with a total capacity on Teesside of about 6 million ingot tons, nearly a million tons more than in 1965, and equal to the capacity proposed by the Benson Committee.

5.120 However, although the group had a capacity of 5 million tons in 1965, production was only 3.6 million tons and fell to between 2.5 and 3.0 million tons in 1966 and 1967. These low figures reflect firstly a cyclical recession and, secondly, heavy international competition affecting the national steel economy, but they also reflect the relatively more difficult circumstances of heavy steel. The previous section showed that the North East, with its production of heavy steel for constructional engineering, shipbuilding, railways, and mining, has tended gradually to reduce its share of national output, whereas the South Wales producers, making strip and sheet for motor vehicles and electrical engineering, have increased their share.

5.121 Apart from the need for steel gas pipes, no economic need was seen in the national steel industry for major developments to be planned and built before 1970, given an expected capacity of 30.7 million ingot tons of crude steel equivalent for that year. South Wales plant can be extended if necessary for sheet production while there is sufficient capacity for plate in the short term. The Benson Committee's forecast of the need for 35 million tons capacity in 1975 was based on National Plan forecasts, before recent re-appraisals of future demand which emphasise the difficulties of steel's position. The downward revision of forward estimates of demand for steel critically reduces the possibility of building new large works in the short term, particularly in heavy steel.

5.122 Therefore, if any additional development were to take place, it would probably be after 1975. It would almost certainly be located on the remaining open land between the existing Lackenby Works and the South Gare where a deepwater jetty was used for some years. Dorman Long (Steel) have now developed about two-thirds of their Lackenby site but their current programme will by no means fill their site. In his evidence to the House of Lords Select Committee (prior to nationalisation), their Chief Engineer said that there was a long term intention possibly to build new berths off the South Gare and that perhaps after twenty years, new blast furnaces might be built in the area, presumably replacing existing capacity in the area, and being connected with Lackenby Works. The steel industry owns all the land necessary for this development much of it needing reclamation at Bran Sands. This land has been shown as a reserve for heavy industry in the urban structure planning.

5.123 Finally, it is worth noting that the construction of a wide strip mill and integrated steel works at Teesside would improve the multiproduct character and competitive position of the Northern and Tubes Group. Any such development might be related to proposals for the construction of a major motor car plant, under Government regional policies. The question of the motor industry is considered in the last section of this chapter. But, even if it were to be pursued, it is unlikely that a strip mill would be built at Teesside. Economies of scale dictate that any expansion of strip mill capacity would be at existing plant and, according to the Iron and Steel Board in the 1964 Report, 'the need for a completely new integrated works on a greenfield site is unlikely to arise'.

5.124 A small part of the employment in Metal Manufacturing (TIG 2) is in foundries, amounting to about 3,600 jobs in 1965. Many detailed changes, including closures, are to be expected by 1991. The largest plant is Cochrane's Foundry at North Ormesby, a part of the Northern and Tubes Group: it is not expected to expand production. The other four, smaller, privately-owned steel foundries have been recently modernised and have diversified their production to serve national markets. No metal manufacturing firms have moved to Teesside since the war and none of the likely changes in this industry would be sufficiently large to affect the urban structure or the employment structure of Teesside.

5.125 The general pattern of change in the metals industry to be provided for in urban structure planning therefore is that a substantial growth in production should be allowed for in the South Bank area between Cargo Fleet and Redcar though with internal redistribution giving the greatest increase to the Lackenby area. This would allow for some use of Bran Sands, including the construction of new deepwater berths: this area should be set aside as a reserve for heavy industry with the expectation that it would be used by the steel industry. There would be continued growth in the area of ancillary industries including oxygen, oil storage and slag processing. The only condition to this general conclusion is that care should be taken not to encroach onto the northern and eastern sides of the South Gare, and Coatham Marsh, which are areas of considerable ecological and recreational interest.

Heavy engineering, shipbuilding and steel using industries

5.126 These industries are fairly extensive users of land on Teesside, covering 430 acres. The trading basis of the seven major firms requires access for heavy and large consignments. All rely partly on rail for the steel supplies, and most are located near the main Darlington-Saltburn railway. The two shipyards and three of the large engineering firms make use of the river, and nearly all the firms find difficulty in despatching large items by road.

5.127 Physical expansion and redevelopment have been considerable in this group since the war. Ashmore, Benson, Pease & Co. Ltd. have completely relocated their works on a new site at Bowesfield Lane, Stockton, as their former site was too small. A marine engineering company has set up a special development at Redcar Jetty, building oil rigs for the North Sea gas exploration. The Furness Shipyard has been modernised as part of an extensive construction programme: nevertheless its closure has recently been announced.

5.128 The construction of major new works is unlikely to recur, because of trading trends and the weight of investment attached to existing sites. The experience of industrial promotion bodies is that it is very rare for new firms to seek new production facilities based on a local supply of steel. Any re-organisation and redevelopment is therefore likely to take place within existing sites, in particular that of The Head Wrightson Group in the loop of the river Tees at Thornaby. The smaller scale of other engineering works and the steel-using industries makes their development plans of less significance for urban structure planning. Most of the known expansion schemes are likely to be on existing or adjacent sites.

Manufacture of construction materials

5.129 These industries include the processing and manufacture of timber products, building and insulation materials. The individual firms depend mainly on local sources of supply or on local markets. They deal in the heaviest and least valuable supplies of materials processed on Teesside, so that transport costs may attain 15 per cent of total operating costs, and the minimisation of transport costs becomes the ruling factor in location decisions. For instance, a ready-mixed concrete firm conducted market surveys before dividing Teesside into three local zones to be served from separate plant. Firms processing steelworks' slag are all located near iron and steelworks or the sites of former works. Thus Stillite Ltd., removed from Stillington to South Bank before engaging in major expansion of production in insulation materials. Two firms are sited by river wharves: Tarmac Ltd., for the export of processed slag and Owners of Middlesbrough Estates Ltd., for the import of timber.

5.130 Expansion of this industry is expected to continue. There has been steady development in these industries since 1950, including four relocations of timber firms, in addition to the new factories outlined above. Stillite expect to double their output by 1970 on the basis of recent and impending plant extensions. Crossley Building Products Ltd., expect to increase their production of bricks: they have a reserve of 350 acres for mineral extraction at Eaglescliffe, of which 50 are in use. It is expected that the working of further reserves of clay will not be necessary by 1991, though the demands of the road building and construction programmes may lead to the development of new plant, especially near supplies of slag.

5.131 The Port Authority does not expect the Tees to supplant Hartlepool's traditional timber trade but new riverside timber yards on the Tees cannot be ruled out, particularly if industrialised building methods develop on Teesside. There is evidence of a continuing demand for riverside sites, too, from gravel processing and ready mixed concrete firms, though no new developments are committed. These firms can require a location to which gravel can be brought by sea, and from which easy distribution is possible to building sites on Teesside.

Long term prospects for new heavy industry

5.132 It remains to consider whether new heavy industries might be attracted to Teesside other than those already discussed. Luttrell's analysis quoted above, and study of other ports, suggests two ports' processing industries that might be considered:

a paper making, especially in view of the existing importance of Teesside trade with Scandinavia. Paper making firms have in fact considered sites at Seal Sands and the Eaglescliffe industrial estate. The latter scheme, however, would have needed the discharge of 1.5 million gallons per day of effluent and agreement could not be reached with the Northumbrian River Authority,

b flour milling and the processing of vegetable and animal oils and fats could develop in theory, but in practice the regional market that could be served from Teesside would probably be too small. For instance, Thornaby flour mills were recently closed, and Teesside bakers are now supplied from Tyneside.

5.133 Industries such as aluminium smelting and highly specialised chemical and non-ferrous metals firms are sufficiently similar to the chemical industry in their modern siting needs that they can be considered under that heading, with Seal Sands as a suitable site for their development. Their interest was shown in recent cases of a type that may well recur.

5.134 Finally, recurring interest is expressed in the idea of attracting the motor vehicle industry to Teesside. The precedent for this is that Government has used this industry as a means for encouraging economic growth in other development areas such as Scotland, Merseyside and Wales. Large scale plant could involve perhaps something of the order of 20,000 workers. It could raise, too, the prospect of associated development, such as a steel strip mill although this is unlikely given the current capacity of the industry and economies of scale.

5.135 It will be shown in the next chapter that a growth of employment on this scale would have implications beyond the boundaries of Teesside, probably drawing upon a labour supply area that included Darlington, Aycliffe and the Durham coalfield unless a much faster rate of migration were induced into Teesside. If it were to occur, the most suitable locations for the plant would lie to the west of Teesside, near Eaglescliffe and Urlay Nook or the east side of Darlington. Plant in this location would be well placed for labour supplies and for external communications by road, rail and air. However, this development is so tentative that it is not reasonable to make it a firm part of urban structure policy. Rather, only an approximate location for the plant has been shown.

Location of light industry and services

5.136 Light industry may be functionally isolated from heavy industry on Teesside not only because there is very little trade between the two sectors but also because heavy industry is site-oriented. That is, the locational needs of heavy industries are so stringent that any choice of location is effectively limited to areas of sufficient size adjacent to river and rail communications. But light industry has need only for direct access to the road system and normal utilities which gives it a much greater choice of location. On Teesside this provides for a much less rigid division between residential and industrial areas than had been the case for heavy industry.

5.137 Light industry is effectively a creation of the post-war years on Teesside. Before the war, and especially before 1930, it was completely confined to serving the local market. The post-war firms have been mainly located on Board of Trade industrial estates. The types of industry attracted to such estates in the rest of the country is wider than the comparatively narrow range on Teesside estates, but share the same characteristics as the local examples. It is reasonable and necessary therefore to regard the attraction of light industry to areas such as Teesside as part of the Government effort to diversify the economies of development areas, of which Teesside is one.

Industrial location and the development areas

5.138 The history of industrial location in the United Kingdom since the 1920's may largely be written in terms of the relative attractions of markets and labour, modified by Government controls and inducements. Technology based on road transport and electric power has to a large extent freed industry at large from the siting restraints of heavy industry. Light industry has developed most strongly in the centre of the national market, in the London area. The relative decline of older industry in other areas produced surplus labour, measured in terms of high unemployment and low activity rates, to which successive Governments have sought to steer growing industry. Northern areas, frequently with only a relatively small local market have generally proved attractive mainly because of their labour reserves. Thus, all eight firms in light industry attracted to Teesside since 1950 have given the presence of reserves of unskilled labour as a reason for their coming to the area.

5.139 A thorough study of the movement of light industry has been made by G. C. Cameron and B. D. Clark, (*Industrial Movement and the Regional Problem*, 1966). They analysed the factors influencing the final choice of an area or site for the location or 141 factories set up in development areas or districts between 1958 and 1963. Three factors were most frequently mentioned as having decisive influence in making the final selection. A local supply of trainable labour was mentioned in 80 per cent of the cases; the active co-operation of the local authority, 58 per cent and accessibility to markets, 44 per cent.

5.140 Nevertheless, other factors were mentioned as being significant. One was the existence of suitable factory buildings, fully provided with services at a low rent. The implication was that local authorities and promoting agencies seeking to attract new factories should be able to ensure that a variety of serviced industrial sites would be available for occupation in any one year.

5.141 Other factors also included the presence of a good, competitive road haulage industry in the locality; facilities for technical education which were not too heavily oriented, for instance, to the dominant industries in an area; and the creation of an attractive environment, including a supply of suitable houses for executives and key workers.

5.142 Pointed examples of all these factors have been noted on Teesside but labour supply and accessibility are undoubtedly the most important factors. Thus, all but 500 jobs in the post-war light industrial firms on Teesside are in categories defined as being almost entirely dependent on labour in their choice of location (G. Logie, *Industry in Towns*, 1952). The Manufacturing Survey on Teesside gave confirmation of this by showing that the cost of labour was about one-third of the total cost of production in these firms.

5.143 Nevertheless, the choice of location by light industrial firms is not entirely determined by labour supply. If it were, the persistence of heavy unemployment in certain localities, in, say, the North East would be hard to explain. A further possible factor could be the question of transport costs. However, the Manufacturing Survey showed that transport costs were less than 4 per cent of the total costs of light industry on Teesside. This is by no means an exceptional figure. A similar result was obtained by the *Inquiry into the Scottish Economy, 1960–61* (the Toothill Committee of the Scottish Council), and Luttrell's survey showed that the additional costs accruing from the movement of firms was comparatively small. He estimated that developing a branch factory rather than extending the parent factory might increase the costs of goods transport to the extent of increasing total operating costs by 2 per cent, and the costs of all other transport, 1.5 per cent.

5.144 Nevertheless, the success or failure of industrial movement lies in this question of comparative costs. G. C. Cameron and G. L. Reid quote evidence from firms which failed to develop in Scotland in their report *Scottish Economic Planning and the attraction of Industry* (1966). These firms mentioned increased costs for the southward despatch of semi-finished goods; loss of orders requiring prompt delivery; and the administrative costs of managerial separation. That is, the problem was not that of transport costs narrowly defined. It was, rather, the advantage of being as close as possible to the main headquarters and markets, a factor of apparent convenience as much as actual costs. This conclusion, too, was brought out in the Manufacturing Survey of Teesside.

5.145 Thus the successful part of Government policy for attracting new industry to the development areas has been the setting up of factories which had suitable supplies of labour and were in the nearest areas to the national markets and headquarters of the migrating firms. This conclusion establishes Teesside as a favourable location for attracting new employment in light industry compared with other development areas in the North East or Scotland.

Location of light industry on Teesside

5.146 Given the general advantage of Teesside's national position and labour supply, the next question is whether there are any pronounced advantages for light industry at particular locations within Teesside. Luttrell stresses that the internal structure of the firm and its own geographical pattern may be as important in the selection of sites for factories as the distance to sources of supply and markets. The Manufacturing Survey showed that nearly 10,000 of the jobs in light industry on Teesside were externally controlled, that is that the functional headquarters of a factory on Teesside was located in another part of the country (table 5.15).

5.147 External control of Teesside industry has increased since the war through the establishment of branch factories and the acquisition of existing concerns. In considering the location of these headquarters, it is valuable to refer to the different classes of inter-factory movement found by Luttrell. In his surveys, contact between factories less than 30 miles apart was very

Table 5.15. External location of headquarters of Teesside light industry

location of headquarters (Standard Regions)	factories established on Teesside before 1945		factories established on Teesside since 1945	
	number	employment, 1965	number	Employment, 1965
Tyneside	6	1,370	–	–
remainder Northern Region	2	70	1	40
East and West Ridings	4	2,890	5	870
North West	2	160	2	430
East and West Midlands	–	–	5	1,990
London and South East	6	730	6	580
Wales	2	70	–	–
overseas	1	80	–	–
TOTAL	23	5,370	19	3,910

Source: Manufacturing Survey (E S 2).
Note. definition of light industry is slightly wider than that given in table 5.11.

close; distances of up to 75 miles were suitable for whole day visits by road and twice daily shuttle services; journeys by managers and executives were made by car rather than by rail for distances up to 150 miles though there was a greater degree of local autonomy for branches

5.148 Nearly half the employment in externally controlled factories on Teesside is controlled from within an 80 mile radius of Teesside, if Sheffield is included. Within this zone, only a few market-oriented industries are controlled from the North East. Virtually none of the post-war developments in market oriented industries, nor the general light industries, are controlled from the North East. Indeed, virtually all the recent light industrial development on Teesside since the war is controlled externally, from headquarters chiefly in the Midlands, and the East and West Ridings; only three relatively small factories were set up and controlled locally.

5.149 The conclusion is that Teesside's managerial connections for light industry are broadly within areas roughly traversed by the A1 trunk road and the proposed Lancashire–Yorkshire motorway and are accessible by car transport, the main exception being those with London. Linkages with the rest of the North East are comparatively few. This confirms the conclusion of the analysis of the trading basis of the economy, that 87 per cent of the sales of light industrial goods are to the south of Teesside.

5.150 Examples from other areas suggest that an urban area of Teesside's size may develop latent geographical disparities: the most accessible districts in any given development area have been more notable for successful growth. Examples include Darlington in the North East, Cwmbran in South Wales, and Kirkby, Huyton and Speke on Merseyside.

5.151 The implication is that a south-western location within Teesside will have a marginal advantage in attracting firms to Teesside compared with other locations. Thus the Stockton–Yarm axis had been a major location for post-war development, attracting six medium-sized firms. The presence of the recently established Eaglescliffe industrial estates and land values in the same area, also suggest that the present area of entry of the A19 trunk road to Teesside is one of greater interest for industrial development. Its main disadvantage is illustrated by comments gathered during the Manufacturing Survey on the poor quality of the present A19, reflecting not so much delays in goods transit, which are small, but the psychological frustration involved in reaching the A1. It is unlikely that the design standard of the road links to the A1 (the A19–A168) will be improved to that of the A1 itself. Nevertheless it remains that a site on Teesside most easily accessible to the A1 will have a distinct locational advantage for managerial communications. By this criterion, the best sites would be those easily accessible from the existing A19; the proposed realignment of the A19; and the A172 road between Ingleby Arncliffe, Stokesley and Middlesbrough.

5.152 There is evidence to suggest, further, that the most successful light industrial estates will be those less than a mile from an access point to the primary road system and also within sight of the road system. It is clear that industry places an inflated but nonetheless important psychological emphasis on good accessibility to a trunk road, as is shown by examples such as the Kirkby industrial estate, close to the East Lancashire road.

5.153 Finally within Teesside, it is important that industrial estates should be easily accessible to supplies of labour. This factor relates particularly to the phasing of industrial and residential development; for instance Thornaby industrial estate is at present peripheral to the main residential areas, and local difficulties have been experienced in housing key workers for Eaglescliffe industrial estate. It relates also to the development of public transport services. Thus factories at Urlay Nook and Thornaby industrial estate are relatively inaccessible by public transport although this is likely to improve as their development proceeds. But problems of public transport are also experienced in areas such as Portrack Lane, Stockton where the lack of residential development is such that only an hourly bus service can be maintained for most of the day. This is inconvenient for lunch-time journeys and other off-peak travel.

Female employing light industry

5.154 It will be shown in the next chapter that the majority of new jobs on industrial estates should be for males. The general argument for the location of industrial estates in the last section relates to this problem. But the location of factories mainly employing females is a different matter. All the available evidence shows that local labour supply is the main locational factor. The Manufacturing Survey showed as a general tendency that factories employing females recruited labour from relatively small areas; and that firms sited in new housing areas, relatively distant from competing firms, tended to have less difficulty in recruiting labour.

5.155 This experience is confirmed by comparisons of travel-to-work and female activity rates. Thus the female activity rate was highest in Middlesbrough where in 1961, only 11 per cent of resident female workers travelled to other local authority areas for work. The actual rate for women aged over 15 was 34.4 per cent compared with 29.7 per cent in Eston, an area of predominantly heavy industry with few opportunities for female employment. More detailed analysis of Home Interview Survey data showed that local activity rates were higher in local authority housing estates, particularly those close to a district shopping centre or a hospital or a female employing factory.

5.156 It is clear that female labour markets are smaller in size than existing Teesside local authority areas and tend to be relatively discrete. In chapter 2, it was suggested that a trend to national activity rates would attract 41.1 per cent of females aged over 15 to work by 1991, assisting the national and the regional economy. To a large extent, this will depend on the distribution of opportunities for female employment. But it is likely that a clear integration of female employing factories with housing areas would aid the achievement of this average female activity rate. The zones in which this policy will be most relevant are noted in chapter 7.

Market-orientated and service industries

5.157 A second departure from the general analysis of the locational requirements of light industry is given by the market-orientated industries, of which the largest are baking and printing, and wholesaling, over 50 per cent of whose sales are to the local Teesside market. Both the Manufacturing and Warehousing Surveys confirm that their main locational need is geographical centrality in relation to their markets. The other important factor is good access from adjoining roads relatively free from congestion. Easy access to railways or close proximity to a major shopping centre were not found to be of great significance as such.

5.158 There has been a substantial amount of relocation in this category since 1950, particularly by the larger firms. This has been occasioned by the unsuitability of former premises, spurred on in the case of Stockton by comprehensive development schemes on the fringes of the town centre. The most favoured locations for new development and for re-siting have been Cargo Fleet Lane, Middlesbrough and Portrack Lane, Stockton. The common characteristic of these two locations is ease of access either to the whole of Teesside or to Stockton and Middlesbrough, the areas south and north of the river respectively. The very few exceptions to this general rule are developments at north Stockton and Billingham, whose market areas are Wider Teesside, including Hartlepool and Darlington; and at Eaglescliffe, on the western fringe, where national road access has been significant.

5.159 Virtually all firms in this category serve Teesside from a single site. This, combined with the pattern of future residential and commercial development, will continue to make the central core between Portrack Lane and Cargo Fleet as the most favoured location for further development. This applies equally to other service industries with the same general locational requirement: local authority depots; refuse disposal, service depots for utilities; and similar establishments. The main proviso for this development is that land should become available and that road accessibility should continue to be improved. The former is given by the continuing development of the municipal industrial estates at Eston, Middlesbrough and Stockton, by the clearance of areas of sub-standard housing in North Middlesbrough and by the progressive abandonment by heavy industry of areas such as Ironmasters. The density of employment in these activities is shown to be relatively low in chapter 7, making them more appropriate for such central areas than light manufacturing.

Office location

5.160 Much of the office employment on Teesside is in the headquarters and drawing offices of the major manufacturing firms. The remainder is in local professional and commercial offices, and local administration. Virtually none is in regional offices of national firms or central government.

5.161 It will be shown in chapter 6 that attempts should continue to be made to attract large offices to Teesside to diversify employment opportunities although there is little precedent for success in this field. Thus, at present the majority of offices moved from London under the aegis of the Location of Offices Bureau go no further than 40 miles, although attempts at a wider dispersal continue to be made, especially of central government offices to the development areas.

5.162 The Bureau notes that firms seek three main types of location: existing offices in the better type of town redevelopment scheme; buildings capable of conversion into offices in attractive surroundings on the perimeter of a town; or, if seeking scope for further expansion, 'campus' sites on the perimeter. Thus, other things being equal, the most suitable town to receive offices would be 'a pleasant place visually and in its amenities, with good shopping facilities including some quality shops, and an adequate supply of good housing in the vicinity'.

5.163 Several of the recent or proposed office developments on Teesside were concerned mainly with convenience. These included the concentration of ICI's Heavy Organic Chemicals divisional office at Billingham; and the proposed office centre for the amenity and the steel industry at Lackenby. Others were concerned with availability of premises, such as Head Wrightson Group's move from Thornaby to Yarm. Yet others have been built in Middlesbrough central area, including Government offices at Green House and several speculative developments.

5.164 The most suitable locations for such office developments would seem to be in the Middlesbrough central area or, provided that public transport and labour supply can be assured, at campus sites in the southern areas of Teesside, such as Nunthorpe-Marton.

Non-locational problems of industry

5.165 The industrial areas of Teesside contain firms with problems that do not arise from their specific location and have not yet been discussed. These problems were revealed by the Manufacturing and Warehousing Surveys.

Labour problems

5.166 Shortages of labour appeared to be the most general problem at the time of survey, the winter of 1965–66: 46 per cent of the manufacturing, and all the warehousing and storage establishments reported some shortages which were sufficiently serious in many cases to restrain production. The shortage was most acute generally in engineering, where there was difficulty in recruiting skilled workers. This to some extent reflects the national shortage of skilled labour, but it is probably emphasised locally by the difficulty in changing from traditional skills in heavy industry to precision machining and engineering. While the expanding engineering and electrical industry was most badly affected there was also a serious shortage of skilled labour in other industries in the area, building products, timber, and printing for instance.

5.167 There was no significant geographical variation in the labour situation; the shortage was common to all parts of the area, though marginally more acute in the Stockton area. Employees faced journey-to-work problems in about 13 per cent of the establishments, especially those at Stockton and Ironmasters. It would seem that there is some correlation between labour shortage in Stockton and problems of providing public transport to the two industrial areas of Portrack and Bowesfield.

5.168 A majority of the establishments recording a labour shortage also experienced high turnover of labour and wage inflation, particularly those in the food, building products and engineering industries. The joint problem of labour shortage and wage inflation was of critical relevance for the attraction of new firms to the area when the principal location criteria of most footloose industries is that of labour availability and cost. Thus 65 per cent of firms new to Teesside since 1950 have had problems, in recent years at least, in maintaining an adequate labour force both in quantity and quality, yet most of these give availability of labour as a reason for originally locating on Teesside. These comments should be viewed in the context of the cyclical variations and high level of construction activity noted in chapter 4.

Site problems

5.169 The main site difficulty, experienced by 17 per cent of the manufacturing establishments, is that of achieving convenient road access to their site and having sufficient room for loading vehicles. This problem is greater at Stockton and South Bank than elsewhere, but it is experienced in all the older parts of the urban area. Conflict with adjacent land uses is seemingly an insignificant problem in the area, but 7 per cent of the establishments had difficulties with premises that were not purpose-built and 14 per cent stated that substantial renovation or replacement of buildings would be necessary by 1970.

5.170 Present site services are in general adequate, though 5 per cent of the establishments were concerned by pressure of water from the mains being too low. Poor drainage is a fairly serious problem in the low lying riverside industrial locations, particularly Ironmasters, South Bank and Bowesfield. At times of high water and storms there is backing-up in the sewers and flooding of basements, and in some cases, workshops.

5.171 Thirty-one manufacturing establishments and eight storage establishments have insufficient land for their likely expansion beyond 1970, and of those, the majority have insufficient land for the next four years. This potential demand for industrial sites is largely concentrated in the older industrial areas of Stockton, Middlesbrough and Redcar, but half the establishments do not require adjacent land and are prepared to move to fresh sites. Very few are likely to need vacant premises. It is not possible to say quantitatively what the demand from existing firms for additional land will be except that it will be very small compared with the needs of firms in light industry new to Teesside, to be accommodated on industrial estates. This demand will be offset, too, by the re-use of small, vacated factories. None of these establishments are in heavy industry. Their needs were described in earlier sections of this chapter but it should be added that relocating firms tend to choose fresh sites that are still located in the same labour supply area as their former site.

Industrial waste disposal

5.172 The chemical industry is one of the main sources of waste disposal on Teesside, producing a very large volume of solid and liquid waste, sometimes toxic. Thus ICI Billingham produces 0.5 million tons of solid waste annually but the company owns sufficient land at Cowpen Bewley to provide for 30–40 years tipping at foreseeable rates. The waste is used for the reclamation of low lying land, for instance as at Cassel works site where some 200 acres have been raised twenty feet. The use of slag by building product firms has been mentioned as a means of disposing of solid waste from iron and steel works.

Transport problems

5.173 Delays to road transport of goods was reported as a serious problem by 13 per cent of the manufacturing, and 40 per cent of the storage establishments. Roughly the same proportions also reported delays in rail transport, though most of these establishments used rail to transport only a small proportion of their goods. Delays in the transport of goods through the docks was not a significant problem and neither was road access to the docks a source of delay.

5.174 Road delays were significantly concentrated in the Stockton area, with specific complaints about congestion on the A19, Stockton High Street and Victoria Bridge across the Tees to Thornaby. The realignment of the A19 should do much to remove this source of congestion. The second area of congestion and road delays was the industrial belt between the river Tees and the Darlington–Saltburn railway. Industry in this area traditionally relied on the river and rail for transport. But transport by road is becoming increasingly important, for example, for the consignment of heavy, large deliveries of engineering equipment from, say, the Head Wrightson Group at their Teesdale Works, Thornaby. Large tracts of this riverside belt, including the Teesdale Works, Ironmasters, Middlesbrough Dock, Smith's Dock and South Bank either have virtually no access for goods vehicles by road or have very unsatisfactory access because of the problems of crossing the railway line including narrow roads; acute bends; bridges having strict weight limitations or inadequate headroom. The realignment of A66–A1084 would improve access to the edge of this industrial belt but further improvements will be required to local roads within the belt.

Locational factors: a summary

5.175 This chapter has discussed all the industrial uses whose demand for land is sufficiently great, or whose locational requirements are so rigorous, that they should be a major factor in the definition of an urban structure policy for Teesside. This leaves for later chapters the questions of employment, the actual positioning of new industrial estates and the related subject of densities of workers per acre. But it is possible at this stage to draw up a list of locational factors which must influence the preparation of an urban structure policy.

Land for heavy industry

5.176 It is clear that the locational requirements of land for heavy industry are so stringent that all undeveloped land within the area generally suitable for heavy industry should be reserved for that use; the case for an alternative type of development would have to be overwhelming for any use other than heavy industry and its associated port, transport and storage uses. In total these activities include: chemicals and steel manufacture; storage of ore, oil and metals; brine pumping and anhydrite mining; port developments; small firms ancillary to the main activities, including processing of waste; road haulage depots, and the development of new industries requiring riverside berths. Special consideration should be given to the future use of any river frontage vacated by its present users or no longer needed by its present owners to ensure that this scarce resource is properly developed. The future use and appearance of other areas of heavy industry likely to be abandoned should also be considered.

5.177 Three large areas should be held in reserve for possible future use by heavy industry. Two of them, Bran Sands on the south bank, and Seal Sands on the north bank are likely to be developed by 1991. The third, Cowpen Marshes and the land east of ICI Billingham, is less likely to be developed but would be suitable. This excludes, of course, the land on the north bank of Greatham Creek which is suitable and, in part, committed for development but which lies outside the Teesside Survey Area.

5.178 The main tract of land for heavy industry and port development therefore lies between Newport Bridge and the sea, bounded by the proposed line of the realigned A86–A1085 on the south; A1130 on the west; Hartlepool railway on the north; and the eastern perimeter of ICI Wilton and Redcar steel works. Further encroachment eastwards, on to Coatham Marsh and the South Gare should not be permitted because of amenity and recreational factors, and the western and northern margins of the area should be used for storage rather than processing purposes.

5.179 The remaining areas of heavy industry outside the major tract are near the river Tees, at Thornaby and Bowesfield Lane, and at Urlay Nook. They rely mainly on rail transport.

Land for light industry

5.180 It has been shown that light industry is relatively flexible in its choice of location. However, a considerable amount of land which was not in use at the time of survey (September, 1965) but which was committed for light industrial use in the sense that it had planning permission and was already laid out with services in many instances.

5.181 This land can be placed in three different categories:

a extensive areas of land properly to be used mainly for light manufacturing:

		acres
Board of Trade industrial estate:	Thornaby	338
local authority industrial estates.	Billingham	104
	Redcar	35
	Sedgefield	30
private industrial estate:	Eaglescliffe	150
other land:	Bowesfield, Stockton	125

b small areas of land remaining to be developed on older Board of Trade industrial estates:
Portrack Lane, Stockton
Cargo Fleet Lane, East Middlesbrough
Skelton,

c other local authority industrial estates:
Portrack Lane, Stockton
Cargo Fleet Lane, Middlesbrough
Eston
Billingham.

5.182 Strictly, the land in category (b) should be excluded from further consideration for future light industrial use because the small remaining area of undeveloped land will probably be required for the expansion of existing firms on the estates, and the land in category (c) has to be excluded because it is rapidly being occupied by service industry and warehousing, for which its location is good.

The river Tees, water supply and effluent

5.183 The main use of the river is for navigational purposes. The public docks, chiefly Middlesbrough and Tees Docks, are used partly for general cargo trade, partly for the needs of heavy industry. The privately owned industrial wharves at South Bank, Cargo Fleet, Bamletts, Billingham Reach and North Tees, and the oil jetties at Tees Dock are used exclusively by heavy industry.

5.184 The future development of the general cargo trade was forecast in the Portbury study, and the National Ports Council recommended a programme of port development of which the most important factor for urban structure planning is the possibility of the closure of Middlesbrough Dock by the 1970's and the concentration of facilities at Tees Dock and, possibly, Seal Sands. The main factor in this would be the reduced need to maintain a clearance of 200 feet on the river for navigational purposes upstream as far as Middlesbrough Dock.

5.185 Analysis of the size of Teesside's local hinterland and comparison with other ports, particularly Southampton, suggest that even if there is substantial increase in general cargo trade, it is unlikely that there would, as a consequence, be a commensurate increase in industrial activity.

5.186 The development of the river is most important, however, for the continued expansion of heavy industry. Teesport and the North Tees wharves are accessible by 63,000 ton tankers and dredging could be extended to give a similar channel to the South Bank wharves. Dredging will not be encouraged above the Transporter Bridge. There is a definite possibility of accommodating 100,000 ton vessels, at least in the mouth of the river and tentative proposals exist for a major ore terminal off the South Gare and berths at Seal Sands. Such developments would enhance the prospects of an expansion of heavy industry on Teesside and would continue the long term trend for a downstream shift in the location of heavy industry.

5.187 It is significant that land uses associated with the existing wharves and dock pre-empt the whole river frontage of reclaimed land, including stockyards, industrial plant and wharves. Schemes for the reclamation of Seal Sands should ensure that industrial uses should not make impossible the development of its river frontage for new industrial wharves.

5.188 The use of the river for launching purposes is of declining importance. Five firms currently use the river but one of these is the Furness Shipyard which seems likely to close, and three of the firms are downstream from the Transporter Bridge. The only remaining firm further upstream is Head Wrightson, who have launching facilities at their Teesdale Works, Thornaby, for the supply of power station boilers to coastal sites.

5.189 Industrial water supplies to Teesside have recently emerged as a major problem, with the argument about the need for a regulating reservoir at Cow Green in upper Teesdale. Water supply in general is discussed in chapter 21, but the need for future supplies for heavy industry can be illustrated by the fact that, say, ICI Wilton uses 21 million gallons per day, increasing at 10 per cent per annum; or that Dorman Long (Steel) anticipates its future requirement at 8.7 million gallons per day.

5.190 The abstraction of water from the river Tees is related to the problems of the discharge of effluent. The question of pollution of the river Tees has been considered by consultants as part of designing a sewerage system for Teesside. The major proposal is for a trunk sewer to carry domestic and less noxious industrial waste to a disposal plant at Eston, and to pipe noxious industrial waste out to sea. But the ability to dispose of effluent satisfactorily could be a major constraint on the further development of heavy industry.

Key locations in the transport system

5.181 Certain activities and locations within the transport system are likely to have significance in determining the future location of industry. Sea transport has already been noted. Railway sidings exist for 80 per cent of Teesside's factory space and for all of its heavy industry. Although there is a decline in the proportion of goods sent by rail, even from heavy industry, rail sidings will continue to be important for making possible industrial growth. However, it seems likely that light industrial estates will not require rail sidings but will depend, rather, on the growth of services at the liner train depot under construction at Portrack Lane. This is a good location as it is close to the favoured area for the development of warehousing and storage firms; in turn, its presence will further enhance the attractiveness of this central area between Stockton and Middlesbrough.

5.192 The importance of points of access to the main roads entering Teesside, particularly from the south, has also been noted. These are likely to be favoured locations for the development of light industry. They are favourable too for the development of warehousing and distribution, particularly on the north and west sides of Teesside for firms also serving Hartlepool, Durham or Darlington.

5.193 However, the centre of gravity for commercial activities on Teesside lies in the area between Stockton and Middlesbrough, near Newport Bridge. In time, the development of the liner train depot and the road construction programme will enhance the accessibility of this area. The probable availability of land at relatively low prices on the fringe of the Middlesbrough central area is the third factor that gives this area its attraction for commercial activities, warehousing and distribution.

5.194 The present significance of Teesside Airport is for managerial communications rather than freight. Insofar as it has locational significance for the industrial development of Teesside, however, it is to favour the Eaglescliffe area for light industries.

6 Employment forecast

Teesside employment, 1965–91

6.1 The final forecast of employment on Teesside in 1991 is made up of three distinct though interrelated components:

a employment from firms in manufacturing and extractive industry already in the area in 1965;

b employment in service industry;

c a residual estimate of employment, the difference between the sum of these two forecasts of employment and the probable supply of labour on Teesside, forecast in chapter 2.

6.2 Employment in existing firms in manufacturing and primary industry on Teesside is likely to fall from about 101,000 in 1966 to about 92,000 by 1991. This forecast is based on an analysis of the prospects of each separate industry now on Teesside and of likely future trends in output and productivity and physical expansion of plant at existing locations. It is a forecast that is largely beyond the powers of local or regional planners to influence, depending as it does on exogeneous factors to Teesside, apart from the availability of a supply of the appropriate labour. A range of forecasts has been made for changes of this category. The selected forecast is a relatively low figure indicating the likely minimum level of employment that can be relied upon.

6.3 Employment in service industries, given the absence of national or regional establishments, is largely dependent on the population using the services and the level of personal income though other factors, including productivity and the elasticity of supply of labour, are also influential. The level of service employment is therefore dependent to an extent on regional planning decisions insofar as they affect the total level of population on Teesside. A conservative estimate, assuming a relatively slow rate of increase in productivity, is that service employment will increase by about 52,000 if the population of Teesside rises to 642,000 (the growth by natural increase) and by a further 16,000 if the full forecast population of 704,000, including inward migration, is achieved by 1991.

6.4 The residual employment forecast is therefore the difference between the supply of labour on Teesside and the likely demand for labour from existing firms and the service industries. The supply of labour seeking work on Teesside in 1991 is likely to be about 321,000 assuming an inward migration of population to give a total figure of 704,000; a rise in female activity rates and a slight fall in male rates to give a labour supply actually resident on Teesside of about 304,000; and a rise in travel-to-work to Teesside to give a net daily inward movement of 17,000 people. The predictable demand for labour from existing industries and services that can be relied upon is about 256,000 jobs. The deficiency therefore is about 61,000 jobs allowing for a relatively low level of unemployment. That is, this number of jobs must be created on Teesside by activities and establishments new to the area since 1965 if the population growth to 704,000 and, indeed, the forecast growth in service employment are to be sustained.

6.5 The most important feature of this forecast is the extent to which it is related to an assumed future level of population. Policy for the regional location of industry is governed primarily by social and economic considerations determined at the national level. In a situation where the foreseeable growth of employment in the existing economy is less than that needed to sustain an assumed growth in population, and where careful consideration suggests that the potentialities of the area can match the faster rate of growth in employment, it is reasonable to use this residual method of calculation. But the implications of this scale of residual employment must not only be examined in this report. If the recommendations are accepted, the implications should be kept under continuous review by bodies responsible for implementing policy.

6.6 The forecast of change in employment in existing manufacture and primary activity relied heavily on data from the Manufacturing Survey (E.S.2), although only a quarter of the firms actually gave a short-term forecast of their future employment. But 72 per cent of all manufacturing employment on Teesside was in establishments with more than 1,000 employees each. The forecasts therefore concentrated on answering two questions: first, the probability that any particular establishment was likely to have closed by 1991; secondly, less reliably, the change in employment by 1991 in establishments likely to remain in being for the twenty-five-year period including the likely effect of plans for expansion and trends. The forecasts relied on analyses of recent trends in production and employment; the sources of supply and the markets for particular industries; on inter-industry linkages, shown in the last chapter to be comparatively slender; on the organisational structure of firms and industries, and for steel and chemicals, on factors of productivity and economies of scale in an international context.

6.7 In each industry, the forecast was qualified by establishing a conceivable range of figures of employment in 1991. The actual forecast is not necessarily the mean figure of the range of forecasts but is rather a relatively low figure of a minimum estimate of the employment in 1991 that can reasonably be relied upon. It must be stressed that in many of the forecasts, some of the precise details and reasoning cannot be given without divulging confidential data; or should not be given because of the speculative nature of the forecast and the danger that public knowledge of the forecast could, in itself, make more likely, say, the eventual closure of a particular establishment.

6.8 The forecast levels of employment in market oriented and service industries were based on the forecast rise in population. In most industries, the ratio of employment to total population was found to be low on Teesside compared with national ratios but recent trends show a process of catching up; that is the Teesside ratios are tending to rise more rapidly than national ratios. Other factors entering the forecasts included projections of personal income and total retail expenditure; the school population; rises in car ownership and commercial vehicle usage; staffing standards and trends in productivity.

6.9 The greater part of this chapter is devoted to a detailed account of the forecasts of employment from existing firms in manufacturing industries and in services. The forecast is summarised in table 6.1. The account is preceded by a general comment on the entire forecast, including the effects of the residual estimate, and the implications for regional and national policies for the location of industry of the need to provide about 61,000 jobs in new activities on Teesside.

Table 6.1. Changes in employment, Teesside, 1965–91: (a) existing firms in manufacturing and extractive industry ('000's)

Teesplan Industrial Group	insured employees 1965	forecast employment 1976	forecast employment 1991	range of employment 1991
01, 03 basic chemicals	31.8	30.6	29.9	25.7–34.1
02 other chemicals	1.2	2.0	1.8	1.7– 2.1
11 iron and steel	27.2	24.2	19.3	17.3–25.2
12 iron foundries	3.6	2.5	2.4	1.4– 2.6
13 brass foundries	0.2	0.3	0.3	0.3– 0.3
21 shipbuilding	4.1	1.9	0	0– 1.9
22 industrial plant	12.1	12.1	14.9	11.3–23.0
23 other engineering	0.1	0.1	0.1	0.1– 0.1
31 baking	2.0	2.0	2.0	1.9– 2.3
32 wire manufacturers	0.8	0.8	0.9	0.6– 1.0
33 miscellaneous metals	1.2	1.6	2.1	1.6– 2.8
34 outerwear	2.6	2.6	2.9	2.6– 3.5
35 light clothing	0.7	0.8	1.0	0.8– 1.0
36 building	2.3	2.9	2.8	2.7– 3.0
37 timber	1.2	1.2	1.3	1.2– 1.3
38 printing	1.1	1.2	1.4	1.4– 1.4
39 telephones	1.1	1.6	2.0	1.9– 2.2
40 woollens	1.4	1.5	1.8	1.0– 1.8
41 miscellaneous	3.3	3.4	3.5	3.2– 3.7
9 Agriculture and extractive	2.9	3.8	2.0	2.0– 2.0
TOTAL	101.0	96.3	91.7	*

Note: see table 6.1 (b).

Table 6.1. Changes in employment, Teesside, 1965–91: (b) service employment ('000's)

Teesplan Industrial Group	insured employees 1965	forecast employment 1991	range of employment 1991
5 retailing	16.2	41.0	35.7–41.0
61 finance	2.3	4.5	4.0– 6.1
62 public administration	6.4	11.6	11.5–11.9
63 law, accountancy	1.3	5.3	4.2– 6.3
64 recreation, catering	6.9	13.4	11.7–13.6
65 miscellaneous services	1.9	3.5	3.1– 3.6
71 construction	16.7	24.1	23.3–24.8
72 utilities	3.3	4.4	4.1– 4.7
73 railways	2.5	2.2	2.0– 2.5
74 road transport	4.4	7.5	7.4– 7.6
75 post and other transport	0.9	1.8	1.7– 1.9
76 sea transport	2.4	1.9	1.7– 2.0
77 wholesale distribution	3.8	5.8	5.0– 8.4
78 laundries, garages	3.3	6.1	5.6– 6.2
81 education	9.2	17.9	17.9–17.9
82 medical services	6.9	12.0	11.7–12.3
82 domestic service	0.6	0.8	0.8– 0.8
TOTAL	99.1	163.8	*

Notes: figures for 1965, insured employees, Ministry of Labour returns; figures include registered unemployed, exclude self-employed (see table 4.3);
figures for 1976, 1991 exclude unemployed, include self-employed, etc.;
*, the range given for 1991 is valid only for each individual TIG;
forecast for 1991 excludes the following (see paragraph 6.20):
TIG 1, 5,000 jobs at Seal Sands,
TIG 4, 53,000 jobs in new, other manufacturing,
TIG 6, 2,000 jobs in new, Government offices,
TIG 8, 1,000 jobs in new Teesside university.

Table 6.2. Employment balance sheet, Teesside, 1991

	male	female	total
resident working population	201,700	102,400	304,100
subtract unemployed	3,000	1,600	4,600
add net daily travel-to-work	15,500	1,500	17,000
total labour supply	214,200	102,300	316,500
employment in existing manufacturing and primary industry	71,350	20,300	91,650
employment in services	89,990	73,610	163,600
total employment from autonomous growth	161,340	94,110	255,450
employment in jobs to be created on Teesside, 1965–91	52,860	8,190	61,050

The employment balance sheet, 1991

6.10 The full employment situation in Teesside in 1991 is likely to be that shown in table 6.2. The resident working population forecast was explained in chapter 2, and the autonomous growth in employment is predicted in the later sections of this chapter. The assumed rates for unemployment are 1.5 per cent for males and females. They are arbitrary figures, quite deliberately lower than would be likely on present trends as the intention is to make a relatively high estimate of the number of new jobs to be created.

6.11 The main item needing further explanation at this stage is the net daily travel-to-work. The current travel is shown in table 6.3. About 13,000 people travel-to-work on Teesside from outside the survey area each weekday, the main directions being from Darlington and Hartlepool, and 4,000 residents of Teesside travel-to-work outside the area, also mainly to Darlington and Hartlepool. The net weekday flow of travel-to-work from every major locality was inwards, to Teesside, giving a net gain of 8,570. The proportion of males and females was not given by the Cordon Survey data, but the Census of Population, 1961, shows that most of the travel was by males

6.12 It is forecast that the net inward travel-to-work is likely to increase by 1991 because of regional disparities in the growth of population and employment, and the greater mobility induced by rising car ownership. The volume of travel was roughly estimated separately for each area using the forecast rates of growth in their population in *Challenge of the Changing North*, and approximate rates of growth in their employment estimated from reference to that report, and data from the Ministry of Labour and the Census of Population.

6.13 The forecast number of people travelling to work from an area *i* to an area *j* is given approximately by the formula:

$$T_{ij} = \frac{t_{ij}}{p_i} \cdot P_i \cdot \frac{\frac{E_j}{e_j}}{\frac{E_i}{e_i}}$$

Where T_{ij}, t_{ij} is the gross number of persons travelling from *i* to *j* in 1991, 1965;
P,p is the population in an area in 1991, 1965;
E,e is the employment in an area in 1991, 1965;

6.14 The results of this forecast were adjusted in an empirical way depending on whether the external area was likely to be suffering from a relatively high unemployment rate, or still to be dependent on an industry such as coal mining. In both these circumstances for instance, the volume of travel is likely to be higher than from an area with a strong local economy.

6.15 In total, this forecast shows an increase in the net weekday travel-to-work from 8,600 in 1965 to 17,000 in 1991, and an increase in the gross amount of travel from 16,900 in 1965 to 26,000 in 1991. The forecast situation is that a strong Teesside economy would attract a considerable increase in the inward travel but that outward travel would increase only very slightly.

6.16 It cannot be too strongly stressed that this employment situation for 1991 described in table 6.2 is both over precise and unstable. A precise forecast of employment in these terms is necessary for the technical reasons of the transportation analysis given in this volume. The methods of predicting and assigning future flows of traffic depend on a description of the population and employment of Teesside which is in

Table 6.3. Weekday travel-to-work, Teesside Survey Area, 1965–91 (person-movements)

		1965			1991		
area	fine zones	inward	outward	net inward	inward	outward	net inward
Tyneside, Wearside	213, 215–16, 218	1,760	320	1,430	2,500	100	2,400
Mid and east Durham	212, 214	1,370	220	1,150	2,800	200	2,700
West Durham	217	1,490	330	1,160	4,000	300	3,700
Darlington, Aycliffe	219, 226	3,160	1,750	1,410	5,200	2,100	3,100
Hartlepool	222	3,330	850	2,480	4,800	1,300	3,500
Whitby	225	1,070	140	930	1,700	200	1,500
remainder, North Riding	220–1, 223–4, 227	650	540	10	600	500	100
TOTAL		12,720	4,160	8,570	21,700	4,700	17,000
male				8,000	19,530	4,030	15,500
female				570	2,170	670	1,500

Source: 1965, Cordon Survey; 1991, predictions.
Notes: sex ratios, for net movement only, estimated from Census of Population, 1961,
inward movement refers to people whose place of residence is outside, and place of work is inside the Survey Area; one person-movement thus represents two person-trips across the boundary of the Survey Area.

balance, in the sense that the numbers of people seeking work must exactly equal the likely number of available jobs. A precise forecast of the type given in table 6.2 is also useful as it indicates a likely situation and therefore the relative scale of action that will have to be taken by the creation of new jobs on Teesside to sustain the forecast rate of increase in population.

6.17 But the real situation in 1991 could be quite different even if the forecast of autonomous growth in employment is correct. The forecast depends heavily on four interacting factors: the volume of migration; local male and female activity rates; daily travel-to-work; and unemployment rates. Very slight variations in the assumed rates for any one of these could lead to substantial changes in the residual employment to be created on Teesside or, if that remains constant, would lead to changes in the other three factors. Thus, if the residual employment is provided but activity rates are lower than forecast, there would have to be an increase in daily travel-to-work. But if the increase in daily travel were very great this would lead in time, probably, to an increase in migration. Similarly, the effects of a shortfall manufacturing employment might be redressed by part-time working in service industry.

6.18 On balance, the situation in table 6.2 is one in which each of the individual factors is based on reasonable forecasts, but in which the autonomous growth in employment is forecast to be relatively slow, so that there is no danger of underestimating the residual employment to be created by jobs new to Teesside.

6.19 Finally, the forecast employment situation fundamentally is based on an analysis and an extrapolation of the Teesside situation in 1961 and 1966–66, that is at periods of relative prosperity in the short-term economic cycle on Teesside. The effect of cyclical variations has been noted in chapter 4.

Changes, 1965–91

6.20 The summary forecast of employment in 1991 by Teesplan Industrial Groups is given in table 6.4. The forecast for 1991 includes the creation of 61,000 jobs in firms and industries not existing on Teesside in 1966. The composition of the new jobs is expected to include 5,000 jobs at Seal Sands, probably in the chemical industry (TIG 1); 53,000 jobs in other manufacturing (TIG 4), mainly on industrial estates; 2,000 jobs in major office development (TIG 6); and 1,000 jobs in a technological university for Teesside (TIG 8). The full explanations of these forecasts are given in later sections of this chapter.

6.21 The full changes in the employment of Teesside can be summarised, distinguishing between the probable situations if there is a migration of population on the assumed scale, giving a population of 704,000 in 1991, or if there is no net migration during the period in which case the population would be about 642,000. The summary is in table 6.6. It will be noted that a substantial increase in new jobs for Teesside is likely to be required whether or not the assumed migration takes place. The fundamental problem is the expected decline in employment in the existing manufacturing industries of Teesside. But of nearly equal importance is the age structure of the population of Teesside and the high fertility rates which lead to the situation that the population of working age on Teesside is likely to rise at nearly the same rate as total population, a quite exceptional circumstance compared with other parts of Great Britain.

Table 6.5. Summary of changes in employment, Teesside, 1965–91

	assuming full migration	assuming nil migration
manufacturing and primary	− 9,100	− 9,100
services	+67,100	+52,100
sub-total, autonomous growth	+58,000	+43,000
residual employment:		
manufacturing	+58,000	+41,000
services	+ 3,000	+ 3,000

6.22 A further characteristic of this changing employment structure is that the service ratio (the percentage of workers in TIG's 5–8) is likely to continue to rise. The ratio in 1965 was 46.4 per cent, a figure slightly higher than that used in table 4.16 which was based on unadjusted data from employment exchange returns. The comparable ratio in 1991 is forecast at 51.9 per cent. This represents a very slow increase in the service ratio, slower than the recent rate of increase on Teesside and substantially slower than is anticipated for the country as a whole. Thus an analysis of recent trends in the service ratio for Great Britain suggests that it will lie between 65 and 70 per cent by 1991 compared with 57 per cent in 1965, or 64 per cent in U.S.A. in 1963.

6.23 The reason for this forecast slow rate of growth on Teesside is mainly that Teesside has in the past failed to attract to it any major service employment serving a wider area than Teesside, except in small Government offices, and that its future rate of growth in population is not likely to be sufficient to make it an effective competitor with Newcastle upon Tyne for regional services. But the forecast slow rate of growth is also partly the result of Teesside having a disproportionately high share of employment in slow growing services such as docks, railways and utilities.

Table 6.4. Forecast of employment, Teesside, 1991 ('000's)

	numbers employed			percentage of total	
Teesplan Industrial Group	1965	1991	change	1965	1991
1. Chemicals	33.1	36.6	+ 3.5	16.6	11.4
2. Metals	30.8	22.0	− 8.8	15.3	6.8
3. Engineering and shipbuilding	15.7	14.9	− 0.8	7.9	4.7
4. Other manufactures	17.3	74.2	+ 56.6	8.7	23.2
5. Retailing	21.6	41.0	+ 19.4	10.8	12.8
6. Central services	20.9	40.4	+ 19.5	10.5	12.6
7. Non-personal services	37.4	53.8	+ 16.4	18.7	16.8
8. Health and education	16.8	31.6	+ 14.8	8.4	9.8
9. Agriculture and extractive	4.2	2.0	− 2.2	2.1	0.6
unemployed	2.5	4.6	+ 2.1	1.3	1.4
TOTAL (rounded)	200.0	321.1	+121.1	100	100

Table 6.6. Approvals of Industrial Development Certificates, Teesside Survey Area, 1948–65

	floorspace ('000 sq. ft)	expected additional employment		
		male	female	total
July, 1948 to February, 1953	4,700	7,500	1,500	9,000
March, 1953 to February, 1958	3,500	3,800	800	4,600
March, 1958 to February, 1963	2,500	3,200	400	3,600
March, 1963 to December, 1965	2,500	3,600	1,800	5,400
TOTAL	13,200	18,100	4,500	22,600

Source: Board of Trade, Northern Regional Office.

6.24 The exceptionally rapid rate of increase in the service ratio between 1959 and 1965 can thus be attributed to three non-recurring factors:

a the very high rate of capital investment by ICI, creating a large construction work force;

b a process of catching up with national standards for the provision of local services as opposed to specialised, regional services;

c a period of relatively easy labour supply because of cyclical depression and structural change in manufacturing industry.

New manufacturing projects

6.25 The 61,000 new jobs to be created on Teesside are therefore of crucial importance for sustaining the assumed rate of population growth. It is clearly not possible to rely on more than a very small proportion of these jobs being in non-local services, say 2,000 in offices and 1,000 in the proposed university; larger numbers would be desirable but could not be taken as reliable assumptions.

6.26 Equally, it is not possible to rely upon more than about 5,000 of these jobs being in new units of heavy industry. The analysis in chapter 5 established that land was available and should be held in reserve for development by heavy industry but only that of Seal Sands was likely, probably by the chemical industry. The successive stages in the development of Teesside's chemical industry have shown great reductions in manpower in terms of new jobs per unit of land occupied or in per unit of capital investment. Thus the density at ICI Wilton is 11 persons per developed acre but that forecast by Monsanto Chemical Company for the development of about 200 acres on Seal Sands is of the order of 1 person per acre and similar densities are found on the latest oil refineries, as at Humberside. The allowance of 5,000 jobs for Seal Sands is therefore fairly high, as it assumes a density of 4.4 persons per acre on the 1,150 acres of land likely to be available for industrial development, the remaining land being used for port development.

6.27 The majority of the schemes for providing new manufacturing employment will require the granting of Industrial Development Certificates (I.D.C.'s) by the Board of Trade before development can take place. The record of approvals for all industrial development on Teesside is given in table 6.6 together with estimates made at the time of application of the employment expected to accrue from the development. The lower rate of approvals between 1958 and 1963 is because most of Teesside was not then eligible, in practice, for special assistance. It ceased to be a development area in 1958 and did not become a development district under the Local Employment Act, 1960, until 1963.

6.28 The record of certificates granted approval on Teesside is more meaningful if it is placed in a regional context and if special note is taken of certificates granted for industrial development by firms new to the area since 1948. The data in table 6.7 reflects the needs of different parts of the Northern Region. The areas receiving a greater than proportionate number of all new jobs were at Darlington and south-west Durham where provision was made for the needs of redundant miners and railwaymen. Both Teesside (mainly because it included Hartlepool in this table) and Wearside expected a slightly greater than proportionate number of jobs from new development. But when the effects are removed of extensions to factories already in the area in 1948, only Darlington and south-west Durham, and Wearside to a lower extent, expected a greater than proportionate increase in employment. A high proportion of the new jobs expected on Teesside was from extensions to existing factories, less than a third of the jobs being in completely new factories. These extensions included the investment programmes of ICI and the steel industry and this type of increase in employment is included as part of the forecast autonomous growth. It is the residual forecast of 53,000 jobs to be created on Teesside that is strictly comparable with the expected additional employment in factories new to the area.

6.29 The expectations of employment likely to accrue from the approved development are not necessarily

Table 6.7. Approvals of Industrial Development Certificates, Northern Region, July 1948–June 1966

	insured employment 1964		expected additional employment			
			all factories		factories new to area	
	'000's	*per cent*	'000's	*per cent*	'000's	*per cent*
Teesside and Hartlepool	225	*17*	28	*20*	7	*13*
Darlington, south-west Durham	98	*7*	21	*16*	13	*24*
Wearside	132	*10*	18	*14*	9	*16*
Tyneside	401	*31*	39	*31*	12	*22*
remainder	451	*35*	24	*19*	12	*23*
TOTAL	1,307	*100*	127	*100*	54	*100*

Source: Board of Trade, Northern Regional Office.

Notes. estimates of expected additional employment made at time of application for I.D.C., proposals not implemented have been excluded from the estimates.

Table 6.8. Average annual additional employment in new factories, 1948–65

	expected additional employment from I.D.C.'s for factories new to the area since 1948 (average number of jobs per annum)		
	1948–60	1960–65	jobs for males (1960–65) (per cent)
Teesside and Hartlepool	140	920	72
Northern Region	1,860	5,740	68

Source Board of Trade, Northern Regional Office

realised. However, factories new to Teesside since 1948 were employing about 5,000 in 1965, which corresponded reasonably closely with the estimate of 6,800 jobs expected in these factories, as the latter figure includes Hartlepool. This type of development, on average, was expected to produce about 900 new jobs per annum between 1960 and 1965, or about 16 per cent of the total expectation for the Northern Region (see table 6.8). But the requirement for 58,000 new jobs (including Seal Sands) for the period 1966–91 implies an average increment of the order of 2,300 jobs per annum, that is more than twice the recent average (which itself was heavily weighted by the special needs of Hartlepool) or 40 per cent of the average number of jobs expected annually in the Northern Region since 1960. Even a reduced forecast of population growth, excluding any inward migration to Teesside, would require an annual average of about 1,600 jobs in new factories which would still be substantially faster than in recent years. Therefore it is clear that a regional growth policy for Teesside will require that the area receives in future a disproportionate share of the employment in firms new to the Northern Region; or that the Northern Region itself receives a higher rate of additional employment in such factories.

6.30 The likely sex ratio among the new jobs to be created on Teesside is also very important. Table 6.2 showed that up to 85 per cent of the new jobs may be for males because most of the additional requirement for female employment will be met by the growth of services. But the proportion of the additional jobs for males expected from new factory development during the last six years on Teesside was about 72 per cent and a smaller proportion within the Northern Region as a whole. It will be important to try to achieve the higher proportion of new jobs for males if there is to be a successful attraction of inward migration to Teesside.

Autonomous growth in manufacturing and extractive industry

The chemical industry

6.31 The increase of employment in the Teesside chemical industry has been the largest element of postwar growth in manufacturing on Teesside but in all probability the period of rapid growth has ended; rapid increases in productivity are likely to offset the effects of future growth in output (see table 6.9). The main period of rapid growth on Teesside was during the development of ICI Wilton, south of the river. The rapid growth of employment came to an end by 1961 and by the end of 1966 about 14,000 people were employed at the works, excluding contractors' employees. Employment on the north bank also grew up to 1961, mainly at ICI Billingham, but then started to fall. As a consequence, total employment in chemicals on Teesside has remained roughly constant since 1961, the same experience as nationally.

6.32 Confirmation that the period of growth in employment had come to an end was given when the then Chairman of ICI noted that there is bound to be a 'period of consolidation' after the recent very rapid rate of investment, though he forecast that there would probably be further substantial growth in the long term though 'not so spectacularly great' as the current programme (Sir Paul Chambers, *Evening Gazette*, 3rd January 1966). Indeed, much of the manpower for new plant constructed in the last few years has been transferred from existing production. This gives a strong argument against simple extrapolation of trends as the means of forecasting future employment.

6.33 The key factor for employment in the chemical industry has been the changes in levels of national productivity of labour. Productivity increased nationally by 21.4 per cent between 1958 and 1961 and the first report of N.E.D.C. predicted that output would increase by 36 per cent between 1961 and 1966 but employment only by 6 per cent (National Economic Development Council, *Growth of the United Kingdom Economy to 1966*, H.M.S.D., 1963). Their second report, however, commented on the reduction of employment achieved since 1961 and anticipated a greater rise in productivity such that employment in 1966 would be lower than in 1961 (N.E.D.C., *Growth of the Economy*, H.M.S.D., 1964). This reversal of expectation, such that future employment in the industry is expected at best to remain constant notwithstanding a continued rise in output, was later included in *The National Plan* (Cmnd. 2764, H.M.S.O., 1965) and is shown in table 6.10.

Table 6.10. Productivity in chemicals, United Kingdom

	average annual	percentage increase
	1960–64	1964–70
output, by value	+5.5	+8.0
employment	−0.4	0
output per head	+6.0	+8.0

Source *National Plan*, pages II–63.
Note: chemicals refers to Minimum List Headings 271–277, Standard Industrial Classification, output by value is at 1964 prices.

Table 6.9. Insured employment in chemicals, 1954–66 ('000's)

	1954	1959	1961	1963	1965	1966
Teesside Survey Area	23.7	33.2	35.0	32.7	33.1	34.7
north of river	17.5	21.1	21.2	18.9	18.0	19.0
south of river	6.2	12.1	13.8	13.7	15.0	16.5
Great Britain	543.0	561.0	578.0	563.0	565.0	570.0

Source: Ministry of Labour employment returns for TIG 1.

Table 6.11. International comparison of productivity in chemicals, 1966

company	group sales £ million	capital expenditure £ million	employment '000's	sales per employee £
Du Pont (U.S.A.)	1,138	191	115	9,900
ICI (U.K.)	885	197	124	7,100
Union Carbide (U.S.A.)	800	128	81	9,900
Bayer (Germany)	623	109	102	6,100
Monsanto (U.S.A.)	580	78	58	10,100

Source: *Chemical Age*, 29th July 1967

6.34 International comparisons of productivity in the chemical industry cannot be precise but there is clearly a difference between American and European firms. Table 6.11 shows the record of the five largest companies in the world in terms of group sales. It was concluded from this comparison that 'there is only one area in which ICI have failed to match Du Pont and that is in effective use of manpower' (*Chemical Age*, 29th July 1967).

6.35 The Economic Development Committee for the chemical industry made a more detailed study of this subject, comparing eight North American and seven British firms (National Economic Development Office, *Manpower in the Chemical Industry*, H.M.S.O., 1967). The Committee found that work attitudes, control and manning practices were all inducing greater productivity in the American firms. Thus, on average, each American works employs only about 80 per cent of the numbers in an average British works but has nearly twice as much capital invested, and production is more than three times higher.

6.36 The ratio of output per man in American plant was about 2.5 times that in British plant. Two-thirds of this difference was attributed by the Committee to differences in the scale of production units, in turn related to the size of market (see table 6.12). The Committee concluded that there would a possibility for saving 36 per cent of the manpower in a British works merely by changing manning practices, let alone by economies of scale.

6.37 ICI were not represented on the Committee, however, and differences in manning were found to be small on the largest, most capital intensive plant such as is now being constructed on Teesside. Sir Paul Chambers, former chairman of ICI, has said that the firm could achieve its present results with a 15 per cent reduction in manpower. Teesside has a quarter of ICI manpower but it is possible that the potential savings in manpower would be less on Teesside because of the scale and newness of some of its plant. Thus, on the new plant coming into operation on Teesside 'the capital per employee is at least as high as on the corresponding plants in the U.S.A. but to bring productivity into line it would be necessary to have more flexibility in the use of employees' time' (T. B. Clark, Chairman, Heavy Organic Chemicals Division, ICI, quoted in *Financial Times*, 9th May 1966).

ICI Wilton

6.38 Productivity has risen greatly at ICI Wilton. Thus employment rose by 21 per cent between 1960 and 1965 but outgoing deliveries doubled, to 610,000 tons in 1965. This is a crude measure as it excludes materials sent by pipeline to Teesport and, by all modes of transport, to ICI Billingham. Future output is likely to show very large increases both because of the effects of the commissioning of new plant and because the works produces the three fastest growing chemical products: organic chemicals, where output rose by approximately 120 per cent between 1958 and 1964, plastic materials by approximately 140 per cent; and fibres, by approximately 200 per cent.

6.39 Forecasts of future employment likely by 1991 are difficult for Wilton as they involve assumptions about productivity and future rates of capital investment and the utilisation of the remaining 1,000 acres of undeveloped land on the site. For the purposes of the forecasts it has been assumed that the effects of higher productivity will offset those of increased output, such that employment will remain generally stable.

ICI Billingham

6.40 National production of fertilisers rose by 31 per cent between 1958 and 1964, with a similar growth at ICI Billingham works which concentrates on this product. Sales per employee at the Agricultural Division rose by 43 per cent between 1961 and 1965. The main source of improved productivity has been the redevelopment of the ammonia plant (S. D. Lyon, Chairman, Agricultural Division, quoted in *Chemical Age*, 28th January 1967). The redevelopment was significant both for manpower and land use. The old, coal-based ammonia plant occupied 51 acres, and took 11.6 man-hours to produce 1 ton of ammonia. The new plant, which cost £15 million, can produce 900,000 tons per annum, that is substantially more than the old plant, yet occupies only 10 acres. Manpower productivity rose eightfold, half of the improvement being due to capital investment, half to changed organisation and methods. By the end of 1966, employment had fallen to 80 per

Table 6.12. Comparison of employment in British and American chemical firms (employees)

	average British firm	average American firm	
		using British production units	using American size production units
production	48	39	22.5
control laboratories	5	3.5	2
maintenance and utilities	21	12	9
works (clerical and administration)	16	9	6
others (despatch, packing, etc.)	10	0.5	0.5
TOTAL	100	64	40

Source: N.E.D.O., *Manpower in the Chemical Industry*, H.M.S.O., 1967.

cent of its 1961 level and the closure of the redundant coke ovens reduced employment by 1,600 men.

6.41 This example has been given to show the effects of investment both on employment and land use at the comparatively old complex of plant at Billingham. It is expected that improvements in productivity will continue to be such that a fall in employment is likely at ICI Billingham.

Other chemicals

6.42 Total employment in TIG 01 and 03 is expected to remain constant, the reduction at ICI Billingham being offset by the expansion of the smaller firms in this group on Teesside: ACC Ltd., at Urlay Nook and British Titan Products Ltd., Billingham. However, the main expansion of the latter firm will occur near Greatham, outside the Survey Area.

6.43 The main industries in TIG 02 on Teesside are coke ovens and the two oil refineries. Following comments by the Benson Committee, it is assumed that employment in the former may decline. The National Plan forecast only a very slow growth in employment in oil refining (0.2 per cent per annum) because of the striking effects of automation. Employment at the two refineries, North Tees and Shell, is likely to be less than 1,000 men.

Future employment in chemicals

6.44 Employment in TIG 1 has varied between 27,000 and 35,000 in the last ten years. Different interpretations of the available data suggest that it will continue to vary within this range, lying between 27,300 and 36,200 in 1991. A central figure, 31,600, has been taken as the forecast, assuming relatively fast rises in productivity. This figure excludes any employment arising from new firms in this industry, particularly that likely from the development of Seal Sands.

Metal manufacture

Recent trends in iron and steel

6.45 Nearly all of the employment in metal manufactures (TIG 2) on Teesside is concerned in the manufacture of iron and steel, about a tenth being employed in foundries. The employment in the Survey Area in 1966 was about 27,000 in iron and steel, and 4,000 in foundries. Two steel works at Hartlepool (Greatham and North Works) are often described as part of the Teesside iron and steel industry. However, all references in this report are to the Survey Area unless the contrary is indicated.

6.46 Teesside accounts for about 60 per cent of the production of the North East Coast which, in turn, provides nearly a fifth of the national steel production. Production in the North East followed the rising post-war trend until 1957. It was severely affected by the recessions of 1959 and 1962 and has since failed to recover its share of national production. Output per man-year in the North East increased by 39 per cent from 1946 to 1955, but underlying growth has since been masked by recessions. Much of the net increase in output since 1959 is explained by the commissioning of new plant at Greatham Works. Total production on Teesside was roughly the same in 1956 and 1964 but employment fell by about 11 per cent, mainly following the closure of the old Acklam works at Middlesbrough in 1962, output being maintained by new plant coming into operation at Lackenby Works.

6.47 This brief account suggests that any longer term forecast of future employment on Teesside must ignore the possible timing of recessions; that increases in output per man are to be expected and are one of the key factors in forecasting; but that output per man is sensitive not only to rates of capital investment in new plant but also to variations in demand for steel and to the need for and timing of the closure of older works. Finally, it is likely that steel production on the North East Coast might gradually decline as a proportion of national output.

Rationalisation of the steel industry

6.48 The forecast of national employment in iron and steel given in the National Plan was that it would decline by 0.7 per cent between 1964 and 1970 but that the decline in the Northern Region was expected to be 6.6 per cent. This forecast was similar to the views of the Iron and Steel Board expressed in their report on *Development in the Iron and Steel Industry* (H.M.S.O., 1964). They confirmed the importance of productivity, showing that national output per man-year had risen by nearly 25 per cent between 1954 and 1966.

6.49 When British and American steel works are compared it is clear that there are substantial differences in productivity. British output per man-year being about half of American. As in chemicals the explanation lies both in scale of plant units and manning per unit. The situation will improve in the long term as older plants are modernised or go out of production, but frequently there is no immediate financial justification for replacing small furnaces before they are worn out. The Board concluded that it was vitally important to reduce over manning where this was possible.

6.50 The Benson Committee pursued this further in their 1966 report, concluding that whereas it took 317,000 workers to produce 27.0 million ingot tons of steel in the United Kingdom in 1965, it should be possible for a rationalised industry to produce 35.3 million tons in 1975 with about 215,000 workers. Productivity would double from 85 tons per man-year in 1965 to 164 tons in 1975. This rate of increase in labour productivity (6.8 per cent per annum) is just double the objective set for the period 1964–70 in the National Plan. However, the Benson Committee's views seem reasonable as a basis for preparing a twenty-five-year urban structure plan. In a period of this length, rationalisation must occur; indeed it is already taking place on Teesside with developments at Lackenby and Greatham. Also, the forecasts of future employment in existing firms tend to be on the low side so that full allowance may be made for possible needs to create jobs in new firms in light manufacturing industry.

Integrated steelworks on Teesside

6.51 The process of rationalisation of the steel industry is leading to a concentration of activity at South Bank, including Cargo Fleet, Cleveland and Lackenby Works and a number of scattered, smaller works. This large complex on South Bank is one of the integrated steel works on Teesside referred to by the Benson Committee, the other being Greatham Works, where special developments in tube making are proposed.

6.52 An approximate indication of employment on the main works at Teesside is given in table 6.13. The main source of data for this table is the Benson Committee's report, giving details of the capacity and production of steel in 1965, the forecast of national capacity and productivity in 1975 and the forecast of total capacity on Teesside (including Greatham Works) in 1975. The employment data for 1965 were taken from Ministry of Labour sources, adjustments being made to exclude unemployed and workers in other steelworks, foundries, fabricating and engineering plant belonging to the two companies, South Durham Steel and Iron, and Dorman

Table 6.13. Production of crude steel by integrated works, Teesside, 1965 and 1975

	crude steel output million tons	employment	tons per man-year
(a) Greatham and South Bank Works:			
1965	3.3	26,600	129
1975 assuming 1965 capacity, 1975 productivity	4.8	26,000	184
1975 assuming 1975 capacity and productivity	6.0	36,600	164
(b) South Bank Works:			
1965	2.4	20,400	118
1975 assuming 1965 capacity, 1975 productivity	3.1	18,900	164
1975 assuming 1975 capacity and productivity	3.6	21,300	164
(c) United Kingdom:			
1966	27.0	317,000	88
1975 capacity and productivity	35.3	216,000	184

Source: see paragraph 6.52.
Note: South Bank includes Cargo Fleet, Cleveland and Lackenby Works.

Long (Steel). Estimates for the South Bank group of works assume that the current, Stage V, modernisation programme of Dorman Long (Steel) has been completed.

6.53 Teesside accounts for about half the total production of the Northern & Tubes Group, and a significant part of national output. It is reasonable to assume that productivity on Teesside will be the same as that forecast for the United Kingdom by 1975 by the Benson Committee. Using this assumption, employment at South Bank could increase by about 1,000 (see table 6.13). It is not possible to make a convincing forecast beyond 1975, but it seems likely that employment will not greatly change in these main works if the compensating effects of increasing output and rising productivity continue to be felt.

Smaller steelworks
6.54 The remaining, smaller works in the Survey Area generally have lower productivity but their gradual closure could have a disproportionate effect on employment. The Benson Committee identified a general group of works 'which are clearly unsuited on technological grounds for long term retention'. In addition there are works which appear unlikely to attain the minimum target size set by the Committee of 1.0 to 1.5 million ingot tons per annum, although many have good modern plant. Several are not only small, but also are on sites which either restrict further development or have a high proportion of plant needing replacement.

6.55 It seems likely that Teesside has a number of works that fall into this category, though neither the Benson Committee, nor the local firms, identified any particular works. On this basis it would be reasonable to allow for the possible closure of four works: Skinningrove, Redcar, Britannia and Malleable. Increased activity is possible in some of these works in the short term but they are unlikely still to be in operation by 1991.

6.56 The Benson Committee went on to stress that the timing of redundancies would be important in connection with social planning. The timing of possible closures is very difficult to forecast as it is related to there being sufficient modernised capacity in the integrated works and to short term cyclical fluctuations in demand for steel. It seems, however, that closures are not likely to occur in the short term but that a reasonable length of time should be available to plan corrective action, should this be required.

Foundries
6.57 Twelve steel foundries were located on Teesside in 1965, employing about 3,600 workers. Of these, the two largest, Cochrane's and Allied Ironfounders, form parts of national firms; two foundries are in the Head Wrightson group; one is part of Dorman Long; and the remaining seven are independent firms. Employment in this industry (TIG 12) has been steadily falling on Teesside, particularly during the 1959 and 1963 recessions. The National Plan noted that national employment in foundries was likely to continue to fall notwithstanding an increase in output of 2.4 per cent per annum. This decline would probably be accompanied by the closure of smaller foundries. In these circumstances, it seems probable that Teesside's employment will continue to fall.

Future employment in metal manufacture
6.56 The total effect of these forecasts is that employment in TIG 2 is likely to fall from 31,000 to between 19,000 and 26,000 by 1991. The working forecast for the purposes of urban structure planning should be 22,000. That is it assumes the closure of smaller works, and rising productivity. This rate of decline is comparable with that between 1954 and 1966.

Engineering and shipbuilding

Shipbuilding and repair
6.59 Only two shipyards remained in 1965 of the once thriving industry on Teesside. Employment then was 4,250, having fallen by a third since 1959, particularly during the 1963 recession. The rapid national rate of decline in employment is likely to level off but the Geddes Report on the basic problems of the industry stressed that the only solution lay in regional groupings of existing shipyards.

6.60 One of the Teesside yards, Smith's Dock on the south bank of the river, is now part of the Swan Hunter group. Shipbuilding at the yard was expected, in May 1967, to continue for 'at least another two years' on the strength of current orders, with ship repair work continuing beyond that time.

6.61 The other yard, Furness on the north bank, was acquired by the Sears Holdings Group in 1951. The yard has been modernised at a cost of £5 million but it made a considerable loss in 1965, mainly due to labour problems including wage inflation and labour shortage at a time of expansion by ICI, and little progress had been made towards including it as part of a regional grouping. The firm announced closure of the yard early in 1968 but since then prospects of continued work have been opened up by amalgamation with a Tyneside group.

6.62 In these circumstances, and given the fact that Teesside employs only 2 per cent of the national industry, it seems likely that shipbuilding activity will be concentrated on the Tyne, Clyde and other rivers, and that no yards will remain open on the river Tees by 1991.

Industrial plant and steelwork

6.63 The remainder of TIG 3 is dominated by the highly specialised sector of engineering devoted to industrial plant and steelwork. Although this industry originally served, and was dependent on, local industries it now has few regular Teesside markets for its products.

6.64 Current employment, at 12,000, is the same as in 1954 but has varied by more than 4,000 between the two dates. Thus the reduction in employment between 1958 and 1963 was associated with the downturn in prospects for the steel industry, with a reduction in orders for new plant, and by increased substitution of concrete for structural steelwork. These changes led Ashmore, Benson, Pease & Co., for instance, to seek more diversified markets.

6.65 But the growth since 1963 has been the result of diversification by the Head Wrightson group, rapid growth by the Power-Gas Corporation (designing town gasmaking plant), and a large aggregate growth by the twenty-eight smaller firms. A considerable number of these latter foresee a continued growth in output and employment. One of these is the Birfield group's factory at Urlay Nook. The group bought 100 acres of land early in 1964, intended for development as a trading estate for the group with, by their estimates, a potential employment of 10,000. The group deferred plans for a second factory. In the forecast only a small allowance has been made for future employment on this estate, which is a conservative assumption.

6.66 The net effect of detailed calculations is therefore that employment in engineering will remain roughly constant to 1976, growth in newer factories being offset by some closures, for instance in steelwork. But, after rationalisation and modernisation, some growth in employment is anticipated in the period to 1991.

Other manufactures

6.67 This (TIG 4) is the only sector of manufacturing in which an overall increase in employment is expected from existing firms, rising from about 17,000 to a reliable forecast of about 21,000. This growth arises from the known expansion plans of existing firms on Teesside and, in some cases, the full development of their existing industrial sites. It excludes any development on new or committed industrial estates and from firms new to the area. These types of development will be needed to provide the additional 53,000 jobs, required in TIG 4 to meet the estimated gap in employment by 1991 which was described earlier in this chapter.

Baking and flour

6.68 All but one of the large premises on Teesside are owned by national groups, but all serve only the local market. Employment rose until 1958 but since then it has remained steady at about 2,000, a trend that follows national experience. Following the analysis given in the National Plan, it seems very unlikely that there will be any increase in any employment in TIG 31.

Wire and miscellaneous metal goods

6.69 Recent trends in employment in TIG's 32 and 33 are difficult to analyse because of classification difficulties and temporary withdrawal of capacity by a larger firm. There is no reason, however, to foresee any substantial change in employment by the larger firms.

6.70 Some continued growth is expected amongst the smaller firms in the industry, though none employs more than 100 persons. They are engaged in a wide variety of activities including steel fabrication, sheet metal working, the manufacture of metal furniture, and other equipment, nuts and bolts, etc. and their markets are mainly outside Teesside. Employment rose by about 8 per cent from 1960 to 1964 and there was a certain amount of relocation. Forward estimates by several firms suggest that this rate of growth can be expected to continue.

Textiles, clothing and telephone apparatus

6.71 These industries (TIG's 34, 36, 39 and 40) employed nearly 6,000 workers in mid-1965 most of whom were females. The majority of the firms came to Teesside between 1945 and 1950 as part of Government policy for the location of industry in development areas. Employment in these firms has fluctuated under three influences:

a their status, usually as branch factories, led to fluctuations in employment of greater magnitude than in their parent industries;

b a record of closures and replacement of firms in the factories concerned, mainly standard factories on industrial estates;

c their flexibility in their employment, especially of married women: thus part-time evening shifts could readily be set up to meet a short-term demand for increased output.

6.72 For these reasons, forecasts of future employment can be only very approximate. This is so particularly as these firms usually have little or no trading connection with Teesside. Also, several firms have grown to the full capacity of their existing sites on industrial estates. They may decide to occupy a new factory in an as yet undeveloped estate on Teesside; but this type of development is considered separately, as part of the requirement for the additional 53,000 jobs on new sites.

6.73 Taking each of the three industries in turn, electrical engineering (which includes TIG 39) is the most rapidly growing sector of employment in national manufacturing. The only large firm on Teesside, G.E.C. Ltd. at Middlesbrough, has been responsible for recent rapid growth in employment and this seems likely to continue. The principal sources of continued growth in textiles and clothing are the recent expansion schemes by existing firms, including the relocation of Rembrandt Dresses Ltd., at Stockton, and Dennimac Ltd., at Middlesbrough, and further development by Paton & Baldwin Ltd., at Billingham.

6.74 In total, employment in this group grew by 1,000 jobs during 1965–66, to 6,960. The forecast of about 7,300 by 1991 allows only for the full development of existing sites, although a variation of density could lead to a possible employment of about 8,500. But any additional growth will have to take place on fresh sites and is therefore not part of this forecast.

Building materials

6.75 Employment in this category (TIG's 36 and 37) has recently expanded, to about 3,500 by mid-1965. Part of the growth was the result of development by F. Hill & Son Ltd., manufacturing timber products at Stockton, using timber from various ports of entry. The remainder came from increased facilities for the manufacture of bricks, cement and abrasives in which new firms were active and an existing works, Stillite Ltd., was expanded. This growth was partly offset by the closure of several older brickworks. Future growth of employment seems unlikely to exceed about 4,100 by 1991.

Printing

6.76 This group (TIG 38) contains about 1,000 jobs, mainly in the printing and publishing offices of the

Evening Gazette, the local newspaper published at Middlesbrough; and in two major and ten lesser printing works. These serve the local market and employment is related to the size of population and level of business activity in the area. Employment is thus likely to continue to rise in the future.

Miscellaneous manufacturers

6.77 Data for this very mixed group of small firms in many industries (TIG 41) suggest that employment might grow slightly in the future.

Agriculture and extractive industry

6.78 The apparent trend in insured employment in TIG 9 has shown a rapid decline from about 5,600 in 1954 to 2,900 in 1966. This trend needs to be carefully interpreted as the figures exclude self-employed farmers but it is clear that employment in agriculture is declining; that employment in ironstone mining in East Cleveland virtually ceased in 1964 having been 1,600 in 1954; but that employment in coal mining has remained stable at about 1,500.

6.79 It is probable that employment in the group as a whole will continue to decline with further contraction in agriculture and coal mining, giving a possible figure of about 2,000 for total employment by 1991 compared with 4,200 in 1965.

Employment in services

Retail distribution

6.80 Employment in retail distribution is likely to provide the greatest single source of new jobs on Teesside other than that to be induced in new manufacturing projects. The greatest single cause of this rise, from 22,000 in 1965 possibly to 41,000 in 1991, is the growth in population though its effects are modified by expected changes in *per capita* expenditure on retail goods and in future estimated turnover of sales per worker in the trade.

6.81 The retail trade employed 10.7 per cent of total employment in the United Kingdom in 1965, and it was the largest section of service employment, if self-employed workers are included in the total. Employment in the trade has grown steadily since 1951 as retail expenditure has risen. But the rate of increase has slackened recently as a result of rapidly rising labour productivity. For this reason, the National Institute of Economic and Social Research suggested that employment nationally might grow at the fairly slow rate of 1.8 per cent per annum to 1975 (see W. Beckerman and associates, the *British Economy in 1975*, Cambridge, 1965), and the National Plan foresaw no increase in employment to 1970, labour productivity entirely offsetting the rise in retail expenditure.

6.82 The basis of the argument about productivity lies in the use of 'supermarket' methods of retailing and, as a consequence of their competition and the effects of slum clearance programmes, a decline in the numbers of corner shops. But it is likely that both causes of rising productivity apply much more strongly in the food trade and are likely to have less effect in the sale of durable goods.

6.83 At present, 10.2 per cent of employment on Teesside is in the retail trade. This proportion is less than the national figure, because of the lower *per capita* expenditure on Teesside, productivity being close to the national average. Future growth in employment is likely to be relatively greater than the national growth because of the faster rate of growth in population and because it is possible that *per capita* expenditure on Teesside may also rise more rapidly than the national average.

6.84 Analysis of urban areas in the United Kingdom suggests that the proportion of an area's employment that is in retail distribution rises as the population of the area itself rises. There are difficulties in the interpretation of data, but it seems unlikely that this factor applies on Teesside. Its relative isolation, and the absence of a large population immediately beyond the boundary of the Survey Area, mean that Teesside could not draw a significantly greater amount of retail trade from beyond its present boundaries.

6.85 It will be shown in chapter 13 that *per capita* expenditure on the retail trade is likely to rise from about £193 per annum in 1966 to about £355 in 1991 (at December 1965 prices). The rise in population thus indicates that the total volume of retail trade is likely to rise from about £93 million in 1966 to £250 million by 1991. The future employment is then forecast using assumptions about the likely rate of increase in labour productivity (see table 6.14).

Table 6.14. Forecast increase in retail labour productivity, Teesside, 1961–91

	percentage rise per annum	turnover per worker at end of period (£ per annum, 1966 prices)
1951–61	1.5	4,080
1961–81	1.5–2.0	5,480–6,100
1981–91	1.0–1.5	6,100–7,000

6.86 These rates of increase may be compared with the national rates of increase of 1.5 per cent per annum between 1951 and 1961, and 2.1 per cent per annum between 1957 and 1961. The forecast assumes that the main impact of new techniques in retailing will be felt during the 1970's and that the rate of increase will subsequently decline. The figures suggest therefore that employment in retailing on Teesside will lie between 36,000 and 41,000.

Central services

6.87 This group of activities (TIG 6) employed about the same number of people as the retail trade in 1965 but its future rate of growth is expected to be very slightly slower, if no allowance is made for possible success in attracting to Teesside regional or national offices of central government.

6.88 Rising levels of income and standards of living have led to greatly increased expenditure on insurance, use of banking services, investments, borrowing from building societies and hire purchase activities. Nonetheless, employment in this sector (TIG 61) is growing relatively slowly because of the influence of rationalisation and mergers, the wider use of computers and the mechanisation of office routines.

6.89 In addition, this type of activity is highly concentrated in London and the regional capitals. At present, Teesside has half the national ratio of employment in this group. In future, employment on Teesside is likely to grow in proportion to the growth in population but probably with an additional increment as it goes through the process of 'catching up' with the average national provision of these services outside London. This gives an anticipated minimum increase from 2,300 in 1965 to about 4,500 in 1991.

6.90 There were about 2,000 people employed by central government on Teesside in 1965 including those employed at the Admiralty stores depot at Eaglescliffe. These mainly are local offices of, say, the Ministry of Labour serving Teesside. Future growth of this type has been projected in relation to population growth. In addition, there is the question of attracting central government offices to Teesside as part of the programme of decentralisation from London. Teesside was considered as a possible location for recent cases of overspill, by Inland Revenue and the Post Office, though an alternative site was preferred for each. A successful example has been the establishment of a Board of Trade office at Billingham.

6.91 Local government services for Teesside are provided at the national ratio of workers to population and future employment is likely to grow roughly at the same rate as population. It is very unlikely that the reorganization of local government authorities in the area will lead to any reduction in employment, partly because of the large geographical extent of the future Teesside County Borough.

6.92 Employment in accountancy, the law and other professions, and in scientific and technical services (TIG 63) is very small on Teesside though it has been growing at a faster rate than the national average, which itself is very rapid. Developments likely in further education and industry make it probable that this rapid rate of growth will continue, perhaps to about 5,000 jobs by 1991.

6.93 Three-quarters of the employment in TIG 64 is in hotels and catering, the remainder being in recreation and entertainment. Between 1961 and 1965 there was a large national expansion of the catering trade: *per capita* expenditure on eating out and alcoholic drink rose by 30 per cent. The consequent rise in employment was offset by a decline in boarding houses and seaside hotels. The National Plan forecast that rising productivity would lead to a stable employment nationally. It seems likely that there will be a substantial relative growth in trade on Teesside with rising incomes and central area redevelopment. It is assumed therefore that employment in hotels and catering will continue to rise.

6.94 The remaining quarter of this group has shown a rapid change since 1954, rises in employment in betting and indoor recreation being offset by the decline of cinemas and theatres. These trends are likely to continue, such that employment will rise in proportion to population.

6.96 Finally, a little less than 2,000 people were employed in 1965 in miscellaneous central area services on Teesside, such as hairdressing, advertising, and business services. It is assumed that these rates of growth will continue in proportion to the growth of employment.

Non-personal services

6.96 This entire group (TIG 7) is dominated by the construction industry, in which were employed nearly 17,000 workers in 1965. The remaining 22,000 workers were in a variety of services, mainly concerned with transport and distribution. This group as a whole is expected to grow relatively slowly partly because of the likely continued decline in employment in rail and sea transport.

6.97 Analysis of the construction industry (TIG 71) is complicated by its extreme fluctuations, employment rising, for instance, from 17,400 in mid-1965 to 22,000 in mid-1966. The main cause of fluctuation is the capital investment and plant maintenance programme of the chemical and steel industries. About 4,000 workers were included in this latter category in mid-1965 and a very conservative estimate would assume that about 2,600 would still be so employed by 1991 even if major new developments did not affect employment at that time.

6.98 The remaining 13,400 workers comprise 6.8 per cent of the total employment of Teesside. This ratio may be on the low side, as 7.2 per cent of total national employment was in construction, though the latter figure included all construction workers. Output per worker has recently been increasing at 5.0 per cent per annum and it has been argued that increasing use of industrialised building techniques will bring further savings in manpower. Thus the National Plan forecast a 4.6 per cent per annum rise in output between 1964 and 1970, to be achieved with an increase in employment of only 0.9 per cent per annum.

6.99 This rate of increase of 0.9 per cent per annum would result in 3.4 per cent of the national population being employed in construction by 1991. The scale of new construction and redevelopment proposed for Teesside, and the heavy capital investment programme by industry, suggest that a ratio of 3.4 per cent for Teesside would be a relatively conservative estimate, giving a total of 24,000 workers by 1991 including 2,600 workers referred to previously, in heavy industry.

6.100 New production facilities will be required for the supply of gas, water and electricity to Teesside. However, the investment will be located outside the Survey Area, at West Hartlepool (gas), Seaton Carew (electricity) and in Upper Teesdale (water). The local gasworks, at Stockton and Middlesbrough, are expected to remain in use only as storage facilities. The remaining employment in TIG 72 is in sales, service and administration. Employment in these is likely to continue to grow.

6.101 Employment in transport (TIG's 73 to 76) has been subject to diverse trends. Total employment was 10,200 in mid-1965 and is likely to rise to about 13,000 by 1991. Two sectors, rail and sea transport, have been declining in employment since 1954. Responsible authorities confirm that the volume of freight to be carried will rise as industrial activities increase but that existing and future plans for mechanisation make it probable that employment will, at best, remain stable. A decline is more likely, especially with the probable closure of the older docks and the use of new methods at the newer docks further downstream.

6.102 Conversely, employment in road haulage (TIG 74) is rising rapidly; employment rose by 60 per cent between 1961 and 1965, to a total of 4,400 in mid-1965. This was a rate of increase substantially faster than the national rate and was associated with the increasing use of road transport by heavy industry. It is estimated that the number of commercial vehicles in Teesside will double by 1991. The greatest growth will be for 'C' licence holders (i.e., those carrying only the goods of their owners) but the general haulage contractors' fleets are likely to rise by 70–80 per cent. A similar rise seems probable in manpower.

6.103 Employment in bus undertakings, however, seems likely to fall as a percentage of population with the forecast greater use of private means of transport. However, a continued steady growth in employment is likely in postal services, Teesside Airport and other transport services.

6.104 Employment in wholesale distribution has been subject only to a slow rise since 1961 both nationally and on Teesside, its percentage of total employment remaining constant. The explanation for this lies partly in greater mechanisation, partly in the tendency for retailers and manufacturers to carry out their own wholesaling functions. However, there may be a slightly greater rise on Teesside in the future because of the rapid growth in population and retail trade. So a range of forecasts is given by assuming, at the least, a constant ratio of wholesaling employment to total employment and, at the most, a rising ratio of wholesaling employment to population.

6.105 The remainder of TIG 77 includes coal, builders' and agricultural merchants and industrial dealers. This is a relatively important, fast growing activity on Teesside because of the metal merchants. Their growth is likely to continue to be rapid. Thus total employment in wholesale distribution, which was 4,080 in mid-1965, could lie between 5,000 and 6,400 by 1991, with a reliable minimum forecast of about 5,800.

6.106 The remaining non-personal services have been grouped together as TIG 78. They include laundries, dry cleaners, and boot and shoe repairing, all of which show a falling trend in employment. But they also include garages and petrol filling stations in which employment on Teesside grew by 70 per cent between 1961 and 1965. The rate of growth is closely associated with the increase in car ownership and travel but, as this is likely to show a slackening rate of increase in the 1980's, it is unlikely that the growth rate will be maintained. Nevertheless, given the absolute increase expected in the number of cars in Teesside, and the forecast rise in expenditure on their purchase and maintenance, it is reasonable to assume that employment will at least double by 1991.

Health and education

6.107 Employment in health and education services (TIG 8) is a major cause of growth, both nationally and on Teesside. Thus, nearly 6,000 additional jobs were provided on Teesside between 1954 and 1965, an increase of 55 per cent and it seems likely that future growth will be from 16,000, in mid-1965, to about 30,000 by 1991. This would be a faster rate of increase than is likely in national employment in these categories, mainly because their present provision on Teesside is below national standards and because increases in 'productivity' cannot be expected.

6.108 Future employment in education (TIG 81) is closely related to forecasts of the future numbers of pupils. This in turn is affected by proposals to raise the school leaving age to sixteen; to the tendency for a greater proportion of children to stay in school after the school leaving age; and, of slight importance, the proportion of children attending boarding schools outside Teesside. The effects of the first two factors have been studied by the National Institute of Economic and Social Research (Beckerman, op. cit.) who estimated that 40 per cent of the national age group aged 15–19 years will be at school by 1975. There may be delays in reaching this standard in view of Government decisions taken since the analysis was made, and it would be unlikely that Teesside would have attained national standards by that time. Therefore, it has been assumed that the rate of growth for Teesside would be such that 45 per cent of children in this age group would be at school by 1991.

6.109 Information on the number of children attending boarding schools outside the area is poor. An arbitrary figure of 5.0 per cent has been assumed.

6.110 The employment associated with a given number of pupils depends on assumptions about future teacher–pupil ratios and the numbers of administrative and other non-teaching staff required by the education service. The present ratio of all jobs in education on Teesside is about one job for every ten pupils. Future recruitment of staff on Teesside is made particularly difficult by the high birth rates in the area. In the light of the National Institute's analysis and forecast, it seems probable that the ratio will fall only to a slight degree, perhaps one job for every 8.5 pupils on Teesside by 1991.

6.111 The full forecast therefore comprises:

forecast number of children in 1991, 5–14 years	132,650
45 per cent of number of children in 1991, 15–19 years	26,880
total number of pupils	159,530
delete those at boarding school	7,970
total number of pupils on Teesside	151,560
total employment, at 8.5 pupils per worker	17,650

This calculation makes allowance for all forms of primary and secondary education and for further education other than at a university. An additional allowance has been made of 1,000 jobs at the proposed Teesside University.

6.112 There is a serious shortage of labour in all forms of health service (TIG 82). Employment forecasts for Teesside are based on the National Institute's analysis and forecast of national growth to 1975, which assume a rising ratio of employment to population. However, data from the Regional Hospital Board suggest that the National Institute's standards for 1975 are probably optimistic as there is a considerable need to make good current deficiencies in the region's health services. However, the process of making good these deficiencies should mean that substantially higher ratios of employment to population could be achieved on Teesside by 1991, as table 6.15 shows.

Table 6.15. Employment in health services, Teesside, 1960–91

	hospital staff		total employment	
		per 1,000 population		per 1,000 population
England and Wales				
1960	468,000	8.9	573,000	10.9
1975	847,000	10.9	825,000	13.9
Teesside				
1965	4,200	8.7	5,700	12.0
1991	8,300	11.8	10,500	15.0

Source: for England and Wales: W. Beckerman and Associates, *The British Economy to 1975* (Cambridge, 1965).

Note: total employment includes doctors, etc. The figure for Teesside includes school clinics, not included in the data for England and Wales.

6.113 The final forecast for Teesside therefore includes 10,500 doctors, staffs of hospital workers and other medical services for the local area. In addition, 500 jobs should be allowed for employment in school clinics, and 950 employees at Winterton mental hospital, Sedgefield. This hospital serves a regional function and is not related to the local population of Teesside. The Regional Hospital Board foresees no change in its employment.

Sex and status of employment

6.114 The forecast of total employment in each industrial group had to be supplemented by a forecast of the division between blue-collar and white-collar jobs in that industry, mainly for the purpose of the transportation analysis in which it was necessary to establish whether the different nature of these types of jobs would lead to different trip-generation characteristics. Secondly, it was necessary to subdivide the total employment into male and female jobs for the purpose of establishing an employment policy for Teesside.

6.115 The definition of blue-collar and white-collar jobs is that given in paragraph 4.12. It is based on the data collected in the Home Interview Survey and is a reasonably good definition for most industries in that it agrees with the definition used by the Ministry of Labour in their analysis of trends in occupational status (Ministry of Labour, *Manpower Studies No. 6: Occupational changes, 1951–61*). It agreed, too, with the classification used in the Employment Survey (E.S.1). However, the Home Interview Survey definition of the status of female jobs in the retail trade and in professions proved to be substantially different from that used in the other sources of data. For this reason, it was not possible to produce a completely reliable set of statistics on the status of female employment for 1966. The final set of data is summarised in table 6.16.

Table 6.16. Summary of employment by sex and status, Teesside, 1966–91

	1966		1991	
	male	female	male	female
manufacturing and extractive:				
blue-collar	65,200	14,400	63,500	27,200
white-collar	17,100		36,500	
service:				
blue-collar	37,500	41,300	41,600	75,100
white-collar	21,900		52,200	

Method of division by sex and status

6.116 The chief principle in forecasting the division of employment by sex and status in 1991 is that the status of total employment in each Teesplan Industrial Group is first forecast, and that the likely sex structure of each status group is subsequently predicted. The reason for this is the hypothesis that, for instance, the level of female employment in the steel industry is dependent not on the total level of employment in the industry but on the number of white-collar jobs that is likely to be available.

6.117 The only data on the occupational status of employment on Teesside is provided by the Home Interview and Employment Surveys: it is thus not possible to identify any trends of the way in which the status may be changing. However, there was sufficient data available to show that the occupational status of individual industrial groups on Teesside was roughly similar to that of the same groups nationally. This was demonstrated by taking the Ministry of Labour data for each class in the Standard Industrial Classification at 1951 and 1961 and extrapolating the resultant trend to mid-1965. In each class (apart from female jobs in retailing and professions) the extrapolated ratio was similar to that observed in the Home Interview and Employment Surveys. Discussions with local industries gave added confirmation of the similarity in trends. This is to say that Teesside's low ratio of white-collar jobs is a consequence of its overall employment structure.

6.118 The forecast structure for each class in the S.I.C. for 1991 was given by extrapolating the national percentage trend between 1951 and 1961 to 1991. The resulting increase in the percentage of white-collar workers in a class between 1966 and 1991 was then applied to the observed percentage of white-collar workers in Teesside in 1965 to give an estimate of the percentage of blue-collar workers in 1991. That is, it was assumed that the national trend would continue unchanged in each industry and that the Teesside trend would continue in parallel with the national trend. Thirdly, it was assumed that the trend would be similar for each of the forty-one sub-groups of the TIG system within the relevant, but much broader, classes of the Standard Industrial Classification. These are very general assumptions which, however, give a possible estimate of the occupational status of each industry on Teesside in 1991.

6.119 An exactly similar method was then used to forecast the likely number of male and female jobs within each status industrial specific group. Thus, a fourfold division of employment between blue-collar, white-collar, male and female jobs was predicted for each class of the Standard Industrial Classification by 1991. These ratios were examined, and if necessary revised, in the light of detailed knowledge of each industry on Teesside and the final predictions are given in table 6.17.

Table 6.17. Occupational structure of autonomous and committed employment, Teesside, 1991 ('000's)

	blue-collar		white-collar	
Teesplan Industrial Group	male	female	male	female
1. Chemicals	15.2	2.3	10.2	2.9
2. Metal manufacture	15.1	0.4	5.1	1.3
3. Engineering and shipbuilding	6.5	1.7	6.0	0.7
4. Other manufactures:				
31 baking and flour	0.5	0.9	0.3	0.3
32, 33 wire, metal goods	1.9	0.3	0.5	0.2
34, 35, 39, 40 textiles, electrical	0.9	5.1	0.3	1.0
36, 37 building materials, timber	2.4	0.3	0.6	0.6
38 printing	0.4	0.1	0.7	0.3
41 miscellaneous	1.5	1.1	0.3	0.6
5. Retail distribution	2.4	6.4	12.2	20.1
6. Central services:				
61, 63 finance, professions	0.2	1.3	3.8	4.8
62 public administration	5.0	1.5	3.4	3.9
64, 65 recreation, etc.	3.2	4.7	5.5	3.5
7. Non-personal services				
71 construction	18.8	0.1	6.1	1.1
72 utilities	2.2	0.2	1.4	0.6
73, 74, 75, 76 transport	7.6	1.3	3.6	0.9
77 wholesale	0.7	0.4	3.8	1.1
78 others	1.8	0.8	3.2	0.5
8. Health and education:				
81 education	0.8	4.3	6.4	7.4
82 health, etc	0.3	4.2	2.1	8.1
9. Agriculture and extractive	0.7	0	1.1	0.2
TOTAL (rounded)	87.0	37.1	76.4	57.7

Note: TIG's 1, 4 exclude new manufacturing projects;
TIG's 6, 8 include new Government offices and university.

The structure of employment in 1991

6.120 The prediction of the sex-status structure of employment derived in this way are for the forecast autonomous growth of employment from existing industries and services. The figures were examined and analysed before the final forecasts were made of the future labour supply on Teesside, given in chapter 2, and the prediction, together with the forecast of labour supply, gives the basis for defining more precisely the required character of the residual employment to be attracted to Teesside. The final, recommended employment structure is given in table 6.18.

Table 6.16. Sex and status of total employment, Teesside, 1965–91 ('000's)

Teesplan Industrial Group	1966 male	female	total	*per cent F*	*per cent WC*	1991 male	female	total	*per cent F*	*per cent WC*
1. Chemicals	29.8	3.3	33.1	*9.8*	*27.9*	26.4	5.3	31.6	*16.6*	*41.4*
2. Metal manufacture	29.1	1.5	30.6	*4.8*	*20.0*	20.2	1.7	22.0	*7.8*	*23.1*
3. Engineering and shipbuilding	14.5	1.2	15.7	*8.5*	*20.6*	12.6	2.4	15.0	*15.9*	*43.9*
4. Other manufacture	8.8	8.4	17.3	*48.7*	*17.6*	10.4	10.7	21.2	*50.6*	*28.7*
new manufacturing projects	–	–	–	–	–	50.9	7.2	58.1	*12.4*	*30.5*
5. Retail distribution	8.2	13.4	21.6	*61.9*	*86.8*	14.5	26.5	41.0	*64.6*	*78.6*
6. Central services	11.0	9.9	20.9	*47.6*	*58.4*	20.8	19.6	40.4	*48.6*	*61.0*
7. Non-personal services	32.2	5.2	37.4	*13.9*	*27.1*	47.1	6.7	53.8	*12.5*	*41.0*
8. Health and education	4.1	12.7	16.8	*75.5*	*74.1*	9.6	22.0	31.6	*69.6*	*69.5*
9. Agriculture and extractive	4.0	0.1	4.2	*3.0*	*40.5*	1.8	0.2	2.0	*10.5*	*67.0*
TOTAL (rounded)	141.8	55.7	197.5	*28.2*	*36.1*	214.2	102.3	316.5	*32.3*	*47.8*

Notes: per cent F is per cent of female workers in total employment;
per cent WC is per cent of white-collar workers in total employment;
new manufacturing projects includes 5 000 jobs in TIG 1, 53,000 jobs in TIG 4;
TIG 6 8 include new central Government offices, and university.

6.121 The most important conclusion about the residual employment of 58,000 jobs to be attracted in manufacturing industry is that up to about 88 per cent of these jobs should be for males. This is because the predicted growth in female employment from existing firms and services will provide jobs for virtually all of the economically active women seeking employment on Teesside by 1991. This ratio is substantially bigger than that recorded for Teesside and Hartlepool between 1962 and 1965, when 72 per cent of the expected jobs were for males (see table 6.8).

6.122 These statistics need to be interpreted with caution, particularly because of their dependence on relatively short term evidence of national trends. However, they clearly suggest that the chief goal of industrial estate development should be to provide jobs for male workers, in contrast to their role on Teesside in the past which has been to raise female activity rates in areas deficient in female employment opportunities. Without these new male jobs on industrial estates, male employment on Teesside would increase by less than 25,000, which would fail to attract inward migration and which would generate insufficient regional income to sustain the predicted increase in service employment.

6.123 These predictions relate to long term trends. It is to be expected that short term fluctuations could lead to extensive substitution of work between sexes and the female ratio shown for the industrial estates itself could vary.

6.124 The mixture of industries on Teesside will remain such that the average ratio of white-collar jobs will remain below national figures. This is explained, in particular, by the fact that Teesside is not, and is unlikely to become, a centre of regional commerce and administration such as is Newcastle. Nor can Teesside reasonably expect to receive much overspill of private offices from London, though it should receive some relocated offices of central government. The only fact that keeps the white-collar ratio on Teesside from being excessively low is the presence of group headquarters, research and development, and design sections of firms in steel, chemicals and engineering. But, in the new light manufacturing industries, the white-collar ratio is likely to be low as these establishments will probably be branches of firms with headquarters in other regions.

6.125 Nevertheless, the forecast increase of white-collar jobs on Teesside, from about 50,000 in 1965 to 150,000 by 1991 is a factor of fundamental social and economic significance, even though the distinctions between blue- and white-collar jobs are tending to become blurred. It will be a main mechanism for raising opportunities for female employment and thus for raising family incomes.

7 Distribution of employment

Forecasting the distribution of employment

7.1 The final stage in the analysis and forecasting of employment on Teesside is to consider its geographical distribution within the Survey Area, using the figures derived in chapters 4 and 6 as the 'control' totals which must always equal the sum of the employment in the separate parts of Teesside.

7.2 It is important clearly to understand the complex sequence of argument that leads to the final forecast of the distribution of employment in each industrial group. Using the terminology of chapter 6, the argument takes the following sequence, summarised in table 7.1:

a the distribution for 1965 is measured as accurately as possible;

b the autonomous change in employment by 1991 whose future location is known is predicted. This includes:

(i) changes in manufacturing and extractive employment in firms already on Teesside in 1965,

(ii) changes in services employment associated with the redevelopment of older housing areas and new residential development whose location forms part of current planning policy, described in chapter 11;

c estimates are made of the changes in services employment likely to be associated with the additional residential development proposed as part of the urban structure policy in Volume I, chapter 6;

d the future employment is forecast on industrial estates for which sites have already been selected and, at least partly, laid out with services but on which industrial development had not yet started in September 1965; at Seal Sands, for central government offices and the proposed university;

e finally, estimates are made of the future employment on additional industrial estates for which a location is recommended as part of the urban structure policy in Volume I, chapter 6.

7.3 This summary shows that a key step in the argument is to predict the employment on industrial estates likely by 1991. It is necessary, firstly, to estimate the potentiality of committed industrial estates, and, secondly, to determine where additional estates can best be located if they are to meet the aims of the urban structure policy set out in Volume I, chapter 5. A special study has therefore been made of changes in the density of employment on industrial estates and their optimum size, described in this chapter.

7.4 The geographical distribution is considered at three different levels:

a the system of 211 fine zones, that used for the transportation analysis. Employment at this degree of detail is classified broadly into manufacturing and extractive jobs and service jobs; within these, into male and female jobs; and, within male jobs only, into those of blue- and white-collar status;

b the system of coarse zones, fifty-eight for 1965–66 and a slightly amended system of seventy for 1991; all references in this chapter, both for 1965 and 1991, are actually in terms of the seventy zone system, the 1965 data having been duly converted. Employment is classified in the nine separate industries of the TIG system and within these, into the more detailed system of forty-one smaller groups;

c the system of fourteen districts used for the analysis and description of the urban structure policy.

The fine zone system is shown in figures 7.2, 7.3 and 7.4. The coarse zone system for 1991 was shown in figure 4.2 and that for 1965 in figure 7.1. And the district system was shown in figure 4.3.

7.5 The distinction between these three separate systems is vital. The coarse zone system is the basic tool for the entire analysis and forecast of employment by industrial groups. The fine zone data is produced by manipulation of the coarse zone forecasts, using simple arithmetic methods and by reference to land use data; it is not an independent analysis and forecast in its own right. The district data are produced by aggregating coarse zone or fine zone data for the purposes of simplified exposition.

Table 7.1. Forecasting the distribution of employment, Teesside, 1965–91

	manufacturing and extractive	services	total
(a) employment, 1965	100,790	96,700	197,490
autonomous growth by 1991.			
(b) location predictable	− 9,090	+44,300	+34,210
(c) location to be determined	0	+22,800	+22,800
residual growth by 1991.			
(d) location committed	+35,200	+ 3,000	+38,200
(e) location to be determined	+22,700	0	+22,700
employment, 1991	149,900	166,800	316,500

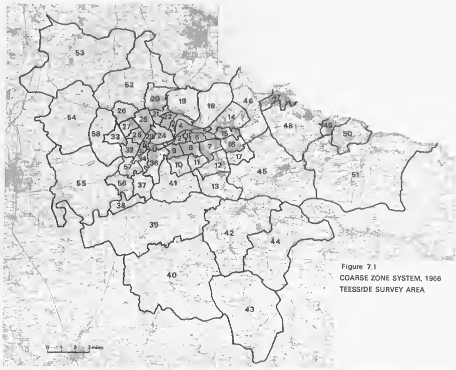


Figure 7.1
COARSE ZONE SYSTEM, 1966
TEESSIDE SURVEY AREA

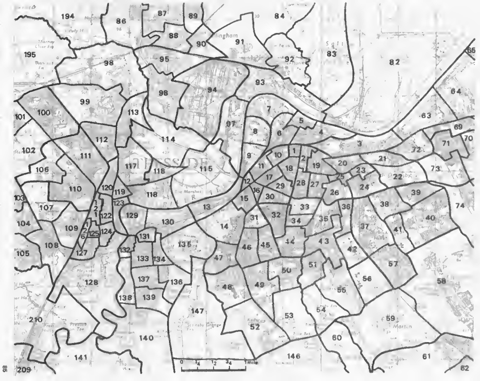


Figure 7.2
FINE ZONE SYSTEM 1966
CENTRAL TEESSIDE

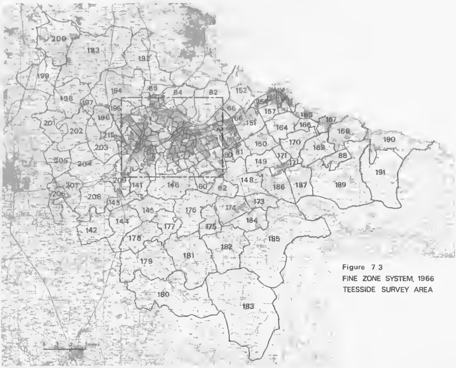


Figure 7.3
FINE ZONE SYSTEM, 1966
TEESSIDE SURVEY AREA

Figure 7.4
NORTH EAST ENGLAND,
FINE ZONE SYSTEM

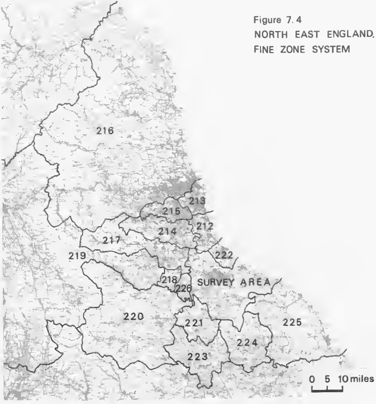


Table 7.2. Estimated deficiency in Employment Survey data, Teesside, 1965

Teesplan Industrial Groups	Employment Survey	estimated total employment	estimated deficiency	
			total	female
1–4. Manufacturing	96,030	96,630	600	0
5. Retail distribution	16,320	21 600	5,280	2,300
6. Central services	15 800	20,690	5,090	2,010
7. Non-personal services	30,270	37,420	7,150	1,170
8. Health and education	12 740	16,790	4,050	4,040
9. Agriculture and extractive	3,040	4,160	1,120	0
TOTAL (rounded)	174,200	197,490	23,290	9,520

Sources: Employment Survey (E S 1);
estimated total employment, table 4 5.

7.6 Some of the problems of measuring 1965 data were discussed in chapter 4: they will be considered in greater detail in this chapter. But the main results both of the 1965 measurement and the 1991 forecasts were presented in chapter 4, to facilitate comparisons of the data. Coarse zone summaries were given in table 4.6 and more detailed district data in table 4.7.

The distribution of employment, 1965

Measuring the distribution

7.7 The establishment of reasonably reliable totals of employment for mid-1965 for each industrial group was described in chapter 4. It was noted that neither the data from the Employment Survey (E.S.1) nor from the Ministry of Labour returns (E R.II) were completely reliable. The final estimated deficiency in the E.S.1 data for the fine and coarse zone systems is given in table 7.2. The significant feature, already noted, is that nearly all the deficiencies are in the service industries. The problem, therefore, is to find a rational method of apportioning this deficiency between the various zones using, as a basis, the two main sources of data supplemented by land use survey data.

Retail distribution
7.8 The total employment from E.S.1 sources was compared with E.R.II figures, adjusted so as to include self-employed workers, for each employment exchange area. It was assumed that the response rate to E.S.1 surveys was greater in the Middlesbrough and Stockton central areas where the average size of shop is larger and that the rate over the rest of Teesside, where small shops predominate, was constant. Therefore a relatively small correction factor was applied to the two central areas and the remaining deficiency in each exchange area was distributed *pro rata* with the number of shops in each fine zone according to the Land Use Survey.

Central services
7 9 Deficiencies in these activities are located almost entirely in the Stockton and Middlesbrough employment exchange areas. The Land Use Survey was used as the basis for a rational apportionment of the deficiency between the fine zones of these two towns.

Non-personal services
7.10 Although the proportional deficiency was not as great as in either of the two previous groups, this is the largest source of deficiency, mainly because of the estimated deficiency of 6,000 jobs in construction (TIG 7). The problem is that these jobs are 'mobile' in the sense that they are on building sites scattered through the developed area, mainly in the Middlesbrough and Stockton exchange areas. Theoretical analysis suggested that 35 per cent of this deficiency was in maintenance work; 40 per cent in new housing development, and 25 per cent in other new development, excluding construction workers at ICI for whom a separate return was made in the Employment Survey. The workers in new developments were distributed in accord with the Land Use Survey, which recorded construction sites. Maintenance workers were distributed on the basis of the amount of development in each zone, allowing for variations in the amount of commercial development.

Health and education
7.11 The deficiency in this group included about 740 workers in domestic service, not covered by the Employment Survey: they were distributed in higher income residential areas. Analysis of the data showed that roughly two-thirds of the remaining deficiency lay in education in Stockton and Middlesbrough. These probably were part-time teachers and cleaners omitted from the Employment Survey. The deficiency was allocated *pro rata* with known jobs in education, checked by data on the distribution of school places. The remaining deficiency includes doctors and clinics in private practice.

Sex and status of employment
7.12 The same two principal sources of data gave the basis for estimating separately the deficiency of male and female workers, using much the same methods as for distributing total employment. The method of establishing the status of employment as between blue- and white-collar jobs was given in chapter 4.

The pattern of 1965

7.13 The outstanding feature of the 1965 pattern of employment is its great degree of localisation. Table 7.3 shows the number of coarse zones which contain respectively 30, 50, and 70 per cent of the total employment in the relevant sector. This degree of concentration

Table 7.3. Degree of localisation of employment, Teesside, 1965

	manufacturing	services	total employment	male	female
number of coarse zones which, added together, contain more than 30 per cent of total employment on Teesside	2	4	3	2	4
,, ,, more than 50 per cent	3	10	6	6	9
,, ,, more than 70 per cent	6	20	13	10	17

Note: total number of coarse zones (1991 system) is 70.

is emphasised by the fact that there are seventy zones in the complete system of which half could be described as urbanised or industrialised in 1965. The table illustrates the very high degree of localisation of both manufacturing and male employment and the lesser degree of localisation of service and female employment. More specifically, eight coarse zones dominate the pattern of employment each with its highly distinctive character. The reasons for this localisation were analysed in chapter 5, and the eight zones are:

21	Billingham	24,000 jobs	chemicals
13	Cleveland–Lackenby	23,000 ,,	steel
51	Wilton	18,000 ,,	chemicals
1	Middlesbrough	15,000 ,,	central area
6	Middlesbrough	9,000 ,,	fringe central area
4	Ironmasters	8,000 ,,	heavy industry
5	North Ormesby	7,000 ,,	heavy engineering, industrial estates and services
28	Stockton	7,000 ,,	central area

Density of industrial development

7.14 The future level of employment associated with particular sites for industrial development involves consideration of the likely density of workers per acre. Land Use Survey data were compared directly with the corrected employment data to give estimates of the density in 1965. These are shown in table 7.4, although certain very low density activities were excluded, such as railways, army land, outdoor recreation and the like.

7.15 From these densities it is possible to identify four main groupings:

a central area activities in retailing, administration and the professions, at about 120 persons per net developed acre (that is excluding development roads, car parking, etc.);

b higher density utilities including garages and depots, at forty or more per acre;

c large land users, such as schools, hospitals, warehousing and storage at about ten persons per acre;

d existing industry at about thirty persons per acre, though varying widely.

Future location of the autonomous growth in employment

7.16 The process of forecasting the autonomous growth in employment described in chapter 6 involved assumptions and forecasts about the location of economic activity. That is, although questions of location are primarily described in this chapter and the total employment forecasts in chapter 6, it would be wrong to see the forecasting process as being in two separate stages.

7.17 This interaction between total employment and its location is of greatest importance in the large scale industries and the activities requiring large areas of land or highly specialised locations. In those activities, characterised by many small firms taking independent decisions, it was assumed that if the forecast of total employment were correct then the land use pattern would adjust accordingly. This applied particularly in the case of service employment.

7.18 Three further points of a general character need to be understood. First, the site constraints of existing manufacturing industry, in terms of the employment capable of being found work on an existing site, formed an important element in determining the forecast of total autonomous growth in manufacturing employment. That is to say, the further growth of manufacturing has to come under the heading of the residual forecasts as the capacity of existing sites will have been reached by 1991. However, the detailed analysis shows that comparatively few cases of actual relocation of an existing manufacturing firm are to be expected. The more usual pattern for relocation is in service industries, such as those being displaced from central Stockton to nearby Portrack Lane. Nor has any allowance been made under this heading for the re-use of abandoned industrial sites, the sole exception being the case of Ironmasters.

7.19 The second general point concerns service employment. It was noted in table 7.1 that part of the autonomous growth in service employment would be related to the extension of activities at existing locations and as part of the development of committed residential areas, but a further 22,800 jobs in service employment would be located in relation to the proposed additional

Table 7.4. Industrial densities, Teesside, 1965

Teesplan Industrial Group	workers per acre	notes
1. Chemicals	20	excludes undeveloped part of ICI Wilton
2. Metal manufacture:	32	
11 iron and steel	30	excluding stockyards
3. Engineering and shipbuilding:	38	
21 shipbuilding	27	
22 industrial plant	44	
4. Other manufactures:	87	
31, 38 baking, printing	100	market-oriented
34, 35, 39, 40 textiles, electrical	<100	female employing
36, 37 building materials	30	
5. Retail distribution	126	
6. Central services:		
82 public administration	113	
61, 63, 85 professions	117	
7. Non-personal services:		
72 utilities	23	mainly works and depots
74 road transport	78	
75 postal services	54	
77 warehousing	15	
78 laundries	39	
8. Health and education:		
81 education	6	including playing fields
82 health	13	

Note: areas refer to the precise land use definition and exclude vacant land, development roads, etc.

housing areas for which sites have to be found. However, for convenience in exposition, the entire growth in service employment has been grouped together and the description refers to employment in the recommended urban structure policy. It will be understood that the actual process of forecasting the distribution of employment was iterative, including successive approximations in the forecasts of population employment and land use.

7.20 The third general point concerns the service employment forecasts for Middlesbrough and Stockton central areas. Activities likely to form part of the central area, in its widest sense, were apportioned to the central area zones (1 and 28, respectively) at the first stage of forecasting. Later analysis of the land use and availability of land subsequently showed that some of these activities would be more likely to be located in adjoining zones where the pressure of demand for space, and therefore rents, would be lower. But, especially in the case of Middlesbrough, it was found that in no circumstances was any constraint on growth of employment likely to be imposed because of a shortage of land. The final forecasts are, however, on the revised basis, treating the central area as a group of zones in each case.

Heavy industry

7.21 Total employment in heavy industry, that is TIG's 1–3, was forecast to fall substantially as a consequence of rising productivity, the development of Seal Sands would be unlikely to do more than offset less than half of the decrease in employment at existing firms. If the analysis is correct, this smaller level of employment will be even more narrowly localised in 1991 than it was in 1965. Table 7.5 shows that Eston and Billingham are likely to contain nearly 75 per cent of total employment in 1991 compared with 70 per cent in 1965 and their combined employment will remain roughly stable. This assumes that Seal Sands and the remaining land at ICI Wilton will be developed, and that the steel complex based on Lackenby will remain the centre of steel making. But the smaller steel works are likely to close and only Stockton, Thornaby and Urlay Nook near Eaglescliffe will have significant amounts of employment, mainly in heavy engineering.

Table 7.5. Distribution of employment in heavy industry, Teesside, 1965–91

	percentage of total employment, TIG's 1–3	
districts	1965	1991
1. Middlesbrough	10.5	3.9
2. Stockton	10.1	10.1
3. Thornaby	4.4	6.4
4. Billingham	26.2	26.8
5. Eston	43.5	47.6
8. Eaglescliffe–Yarm	1.1	3.7
12. East Cleveland	3.1	0.8
remainder	1.2	1.0
TOTAL (rounded)	100.0	100.0

Note: figures include 5,000 jobs on Seal Sands, district 4.

Light industry

7.22 The total autonomous growth in existing light manufacturing industry (TIG 4) is comparatively small. Much of it is likely to result from known schemes for the extension of existing firms and due allowance has been made for these. The remaining increase was applied proportionally to the existing pattern of employment. As a consequence, Middlesbrough and Stockton districts will continue to have 70 per cent of this type of employment, Eston 10 per cent, and the remainder being widely scattered.

Retail distribution and central services

7.23 The future pattern of employment in TIG's 5 and 6 is closely related to the distribution and function of shopping centres in Teesside which in turn is related to the distribution of population and the urban structure policy for Teesside. The analysis of shopping in chapter 14 shows that the recommended hierarchy of central places should include the regional centre at Middlesbrough; a major centre at Stockton, large district centres at Billingham, Redcar and Thornaby, and the series of smaller district centres given in table 14.25

7.24 The basis of the forecast of the distribution of employment in retailing in 1991 came from the prediction of future retail sales given in chapter 14. It was clear from the analysis of 1965 that there were differences in the average rate of annual turnover per employee and these were applied in the forecasts By 1991, the likely range lay between about £5,900 per employee in central areas and £5,370 per employee in zones without any large centre.

7.25 The same general principles were used in predicting the distribution of the separate activities that make up TIG 6, central services, though the analysis was made in two stages.

a The likely ratio of total employment in the group between major central areas and other central areas was established. For the purpose of this, Middlesbrough, Stockton and Redcar were defined as major central areas providing regional services: the remaining centres included the new, expanding and stable district centres listed in table 14.25 and a number of smaller but clearly identifiable centres which either had a significant employment in these activities in 1965 (such as Norton or Sedgefield) or seemed likely to do so by 1991.

b The likely ratio of employment between the centres within each category was then predicted.

7.26 Insurance, banking and finance (TIG 61) is clearly predominantly located in the major centres, to the extent of their containing 80 per cent of the employment by 1991, in effect only banks being relatively widely distributed. An even higher proportion of jobs in the legal and other professions (TIG 83) seem likely to be in the main centres, perhaps more than 90 per cent. For these groups plus the jobs in miscellaneous service and hairdressing (TIG 65), analysis of retail sales, distribution of population, accessibility and the 1965 pattern of employment suggested that Middlesbrough would provide 75 per cent of the total employment in the regional services; Stockton, 20 per cent; and Redcar, 5 per cent.

7.27 The distribution of the jobs in government and public administration (TIG 62) was on a different basis. The forecast of 13,800 jobs by 1991 included 5,000 jobs in central, and 8,800 jobs in local government. The former included the Admiralty stores depot at Urlay Nook, assumed to continue to be in Government use and the desirable attraction of 2,000 new jobs in central government offices brought to Teesside, for which the suggested location is Middlesbrough central area. The remaining jobs were divided between departments already in Stockton, Middlesbrough and Billingham and in the smaller, local offices such as those of the Ministry of Labour.

7.28 The forecast figure for local government is an increase of 2,900 between 1965 and 1991. Assuming that most large existing offices and depots remain in use with about their present employment, the increase is likely to be located predominantly in central Middlesbrough on the basis that it becomes the centre of administration for the new county borough.

7.29 It was assumed that 40 per cent of the jobs in recreation and catering (TIG 64) would be in the three major centres, in the proportions of 50 per cent in Middlesbrough, 35 per cent in Stockton and 15 per cent in Redcar. The relatively high ratio for Redcar is a reflection of its role as an entertainment centre. For the prediction of this activity, this ratio of 40 per cent applied very strictly to the central areas in a narrowly defined sense. Analysis of trends in the distribution of clubs, cafes and public houses showed that the periphery of a central area is an important location. But the process of redevelopment and urban renewal is likely to make this a less attractive type of location in 1991 than it was in 1965, because rents are likely to be relatively higher and the population in the immediate hinterland, lower. Nevertheless the peripheral areas of the three centres are predicted to have 22 per cent of total employment in the group, the main district centres 35 per cent of all jobs, and the more local centres, 28 per cent. The latter ratio, too, is lower than the corresponding figure for 1965, reflecting the trend towards there being fewer public houses situated in residential areas and small, neighbourhood centres. Finally, 15 per cent of the jobs were predicted as being in the rural areas around Teesside, a continuation of the rising trend for 'dining-out', recreation and leisure being spent in the countryside within easy driving distance of major urban areas.

7.30 The effect of these changes in the pattern of retail distribution and central services is shown in table 7.6. Employment in these groups is expected to rise by 94 per cent during the twenty-five year period but the increase will not be evenly distributed. In 1965, about 54 per cent of total employment was in the two central areas, 37.8 per cent in Middlesbrough and 16.3 per cent in Stockton. The predominance of Middlesbrough over Stockton was greater in retail distribution than in the other central services, and the centralisation of the retail trade employment was greater than that for the other services. Both types of activity will increase by roughly the same ratio by 1991 but the pattern of distribution of the retail trade is likely to be more sensitive to the distribution of population than is that of the other central services. By this, it is meant that the much wider dispersal of population makes retail trade likely to be more widely dispersed in 1991 than it was in 1965. But this loss of relative importance in retail distribution (though not of actual employment) by the two main central areas is likely to be compensated for by the rise in relative importance in the other central services, and, as will be shown in chapter 14, the loss of relative importance in retail distribution is likely to be confined to the trade in convenience goods: durable goods will remain specialised in their choice of location.

Non-personal services

7.31 The pattern of distribution of these services shows no evidence of being directly related to the distribution of retail sales or population as they do not form the object of business or shopping trips by the public. Their location is related to the communications system and access to commercial or industrial areas or, in the case of construction, to probable areas of development.

7.32 Nearly half of the jobs in TIG 7 are expected to be in the construction industry. The different facets of this industry are shown in table 7.7. The higher proportion of employment expected to be in new house construction is a consequence of the more rapid growth of population expected on Teesside. The following principles were used in predicting the distribution of these categories.

a Employment on the construction of new houses was distributed according to the expected pattern of development and urban renewal at the end of the 1980's. The phasing of development in the recommended urban structure was of paramount importance. Thus most of the construction labour force is likely to be at work at Kirklevington (coarse zone 38) and Newham (coarse zone 43), the areas likely to be the last to be developed in the period to 1991.

b The construction workers in other new development were apportioned, first, to the sectors of investment identified in Volume I, chapter 7, table 7.1; and second, the probable location of investment in each

Table 7.6. Distribution of employment in central area activities, Teesside, 1965–91

	central Middlesbrough	central Stockton	elsewhere	total
employment in 1965				
retail distribution	8,830	3,550	9,220	21,600
central services	7,190	3,360	10,340	20,890
TOTAL (rounded)	16,010	6,910	19,570	42,490
employment in 1991				
retail distribution	12,010	5,830	23,160	41,000
central services	18,010	6,590	15,800	40,400
TOTAL (rounded)	30,020	12,420	38,960	81,400
percentage employment in 1965:				
retail distribution	40.9	16.4	42.7	100.0
central services	34.4	16.1	49.5	100.0
TOTAL (rounded)	37.7	16.3	46.0	100.0
percentage employment in 1991:				
retail distribution	29.3	14.2	56.5	100.0
central services	44.8	16.3	39.1	100.0
TOTAL (rounded)	37.0	15.3	47.7	100.0

Notes: central Middlesbrough is coarse zones 1, 2, 6, 8 and central Stockton, coarse zones 27–29 (1991 system); retail distribution is TIG 5, and central services, TIG 6.

Table 7.7. Employment in construction

	percentage of employment		forecast employment Teesside, 1991
	Great Britain, 1965	Teesside, 1991	
new house construction	26	33	8,000
other new developments:			
chemical industry and others	42	42	2,600 7,600
maintenance	30	26	6,000
TOTAL	100	100	24,100

Source: Great Britain, 1965, from *National Plan* (H.M.S.O., 1964).
Note: Data are for TIG 71.

sector was identified by the phasing of the urban structure policy, that is in the last of the industrial estates to be developed, the reclamation and development of Seal Sands, the last of the district centres and the latest stages of the road construction programme.

c An approximate formula was found for estimating the likely distribution of maintenance construction work, related to the number of dwellings in a zone, and the forecast employment in that zone.

7.33 The distribution of workers in utilities and transport (TIG's 72–76) in 1991 is closely related to that of the present location of offices and depots, where workers now report for work, as few new developments are expected in this sector. These comprise:

a North Tees power station of the CEGB, and the main offices of the NEEB at Thornaby and Redcar;

b the existing stations and depots of the rail system, with some reductions at the smaller depots, the recent transfer of office employment from Middlesbrough to Newcastle, and the growth of work at the liner train depot;

c bus depots and stations, and road haulage depots, though with a disproportionate growth at Middlesbrough bus station, the probable need for a new bus depot at Ingleby Barwick, and intensified use of land at Cargo Fleet and Bowesfield Lane and other locations by road hauliers;

d Teesside Airport;

e Teesport as the main centre of sea transport, though with some growth at Seal Sands as facilities are developed on the north bank of the Tees, and a reduction at Middlesbrough Dock and other upstream wharves.

7.34 Detailed analysis of the location of warehousing and storage, given by the warehousing survey (E.S.3), gives the basis of forecasting future employment patterns in this sector (TIG 77). Cargo Fleet and Portrack Lanes have provided attractive locations because of their centrality within the urban area, their proximity to the central areas and their accessibility to the main road system. In the past, there has been some tendency for the two areas to provide similar services, Cargo Fleet serving the south bank and Portrack the north. This was a consequence, in part, of the difficulties set by the river Tees and partly by the division of Teesside between two administrative counties and a county borough. Assuming that the remaining undeveloped land on the local authority estates in these areas is fully developed at a gross density of about fifteen persons per acre, a minimum of an additional 100 acres is likely to be required for warehousing, wholesaling distributors and storage activities by 1991. The availability of land, the construction of the primary road system and requirements of this industry show that this additional land could best be found, first, at Cannon Street, Middlesbrough, west of the central area; and, subsequently, at Ironmasters.

7.35 The remaining employment in TIG 7 is mainly in the motor trade and garages. Analysis of the 1965 pattern shows that the employment tends to be located, first, in the vicinity of the main central areas and, second, along the main road system.

7.36 The final, forecast distribution of employment in non-personal services (TIG 7) is shown in table 7.8. This pattern is of great significance as this group employs the majority of males working in the service sector. It shows the increasing tendency for the creation of a highly centralised system of male service employment, more than half of the permanent jobs being located in Middlesbrough and Stockton, with comparatively few permanent jobs being created in the outer, suburban areas of Teesside.

Health and education

7.37 These activities (TIG 8) are distributed broadly in relation to the forecast distribution of population but much of the employment will be on a few, comparatively large sites. For education, this means three separate sets of forecasts.

a Secondary schools are expected to employ about 9,520 staff, a ratio of 13.5 workers per 1,000 population,

Table 7.8. Distribution of employment in non-personal services, Teesside, 1965–91

	1965		1991		1991	
district	total	*per cent*	total	*per cent*	construction	remainder
1. Middlesbrough	12,420	*33*	13,660	*25*	2,660	11,000
2. Stockton	6,600	*18*	7,420	*14*	1,710	5,710
3. Thornaby	2,940	*8*	4,470	*8*	830	3,640
4. Billingham	4,530	*12*	6,650	*12*	4,700	1,950
5. Eston	5,220	*14*	5,150	*10*	3,050	2,100
6. Redcar	1,620	*4*	1,950	*4*	430	1,520
7. Nunthorpe–Marton	1,300	*4*	4,510	*8*	3,760	750
8. Eaglescliffe–Yarm	460	*1*	7,400	*14*	6,540	860
9–14. remainder	2,310	*6*	2,580	*5*	1,410	1,170
TOTAL (rounded)	37,420	*100*	53,800	*100*	24,100	29,700

Note: total refers to TIG 7, construction to TIG 71.

Known plans for the closing of older schools, the creation of school bases at committed sites and the provision of new sites for areas still to be developed for housing formed the basis of the forecast.

b Primary schools are likely to employ about 8,700 staff, at a ratio of 9.6 per 1,000 population. The sites for primary schools have not been recommended as part of urban structure policy, and therefore, zonal forecasts of employment were calculated as a proportion of the forecast population, assuming that zones with a population of less than 5,000 would not be large enough to sustain their own primary school.

c Other education employment includes 1,000 jobs at the Teesside university, 1,350 at technical colleges and the Teesside polytechnic, and 250 in central administration, for all of which the future locations were known.

7.38 The Regional Hospital Board and Management Committees have provided details of their expected long-term plans. The only addition to these plans is that the proposed development of Levenside will probably make necessary the provision of a district general hospital in the vicinity of Hemlington. Employment was distributed *pro rata* with the forecast size of the hospitals. The remaining employment in medical services included doctors and general practice, in relation to zonal population; dentists and local clinics, in relation to local and district centres; and specialist services, at the three main central areas.

7.39 The resulting pattern of employment is important as this type of activity is a major source of dispersal of female employment opportunities throughout the urban structure. Inevitably, it leads to a changing pattern whereby employment in the Middlesbrough district remains stable but its share falls considerably as new opportunities are created at Levenside and Nunthorpe–Marton (see table 7.9).

Sex and status of employment

7.40 The zonal distribution of male and female jobs, and blue- and white-collar jobs, was calculated by application of the average proportion, for Teesside, of employment of a particular industrial group within each category. The calculation was simplified by combining certain industrial groups as follows, or by modifying the results empirically.

TIG 1. Chemicals: treated as a single group, but modified to allow for higher ratio of white-collar workers at ICI offices and research laboratories, Billingham;

TIG 2. Metal manufacture: treated as a single group, but modified to allow for proposed main offices at Lackenby;

TIG 3. Engineering and shipbuilding: treated as a single group but modified to allow for Power Gas Corporation's drawing offices at Stockton; the relatively high sex ratio of six larger firms (20 per cent female); and the low ratio of small firms (6.7 per cent female);

TIG 4. Other manufactures: grouped into the male employing industries (TIG's 32, 33, 36–38) with 79.6 per cent male jobs; the female employing industries (TIG's 34, 35, 39, 40) with 84.1 per cent female jobs; and the general industries (TIG's 31, 41) with 52.5 per cent female jobs;

TIG 5. Retail distribution: treated as a single group;

TIG 6. Central services: treated as three separate groups, namely TIG's 61, 63 and 65; 62; 64; each with its own ratios;

TIG 7. Non-personal services: treated as three separate groups, namely TIG's 71; 72, 73 and 76; 75, 77 and 78; though in each case modifications were made such that female jobs were located only in zones with administrative offices;

TIG 8. Health and education: treated as separate groups, but with a higher male ratio for the proposed university;

TIG 9. Agriculture and extractive: treated as a single group.

7.41 The results of this forecast of the likely distribution of the autonomous growth in employment are summarised in table 7.10. The most significant result is the degree to which 80 per cent of this growth is likely to take place in only a few districts: the central core of Teesside in Middlesbrough and Stockton; and the two growth districts of Nunthorpe–Marton and Egglescliffe–Yarm. This applies to the increase in both male and female jobs. The higher rate of growth for female jobs is, of course, a consequence of the concentration of female jobs in service employment.

Industrial estates for Teesside

7.42 The autonomous growth given in table 7.10 accounts for the location of 85 per cent of the new female jobs required on Teesside, but only 30 per cent of the new male jobs. The future location of 50,900 male and 7,100 female jobs has yet to be analysed. This is the residual growth in manufacturing employment referred to in table 7.1, as the residual growth in service employment has already been located.

7.43 The future location of these 58,000 jobs falls into three categories:

a employment in heavy industry at Seal Sands is likely to be of the order of 5,000 assuming a gross density of about four workers per acre;

b employment on land suitable for heavy industry at Bowesfield Lane, Stockton could provide 3,100 jobs assuming a density of twenty-five jobs per acre; this is

Table 7.9. Distribution of employment in Health and Education, Teesside, 1965–91

	1965		1991	
district	total	*per cent*	total	*per cent*
1. Middlesbrough	6,940	*41*	6,960	*22*
2. Stockton	2,510	*15*	4,000	*13*
3–6. remainder, urban Teesside	3,040	*18*	7,470	*23*
7. Nunthorpe–Marton	720	*4*	5,460	*17*
8. Egglescliffe–Yarm	270	*2*	2,980	*10*
10. Sedgefield	1,510	*9*	1,800	*6*
remainder, rural Teesside	1,810	*11*	2,940	*9*
TOTAL (rounded)	16,790	*100*	31,600	*100*

Note: data are for TIG 8.

Table 7.10. Changing pattern of employment by autonomous and committed growth, Teesside, 1965–91

district	employment, 1965	change in employment, 1965–91			index numbers, 1991 (1965 = 100)		
		male	female	total	male	female	total
1. Middlesbrough	53,500	3,320	8 900	12,220	111	138	123
2. Stockton	30,310	4,800	4,250	9,050	125	138	130
3. Thornaby	8,710	3,120	2,600	5,720	146	240	166
4. Billingham	29,420	−3,160	3,640	480	87	175	101
5. Eston	44,600	−1,210	3,160	1,950	97	182	104
6. Redcar	6,180	1,910	3,170	5,080	161	205	182
7. Nunthorpe–Marton	2,650	6,090	5,220	11,310	452	867	527
8. Eaglescliffe–Yarm	3,820	10,430	5,160	15,590	442	770	510
9. Stillington	1,340	− 140	50	− 90	87	123	93
10. Sedgefield	4,010	−2,010	450	−1,560	28	138	61
11. Saltburn–Marske	2,560	580	150	730	149	111	129
12. East Cleveland	5,330	−1,790	290	−1,500	64	120	72
13 Guisborough	2,890	300	720	1,020	118	157	135
14 Stokesley	2,170	560	430	990	138	180	145
TOTAL (rounded)	197,490	22,800	38,190	61,000	115	171	131

land not yet developed or laid out for industry, but in a location where ownership and accessibility makes this type of development likely;

c therefore, sufficient land has to be provided in the form of serviced industrial estates, correctly phased, to make probable the creation of at least 50,000 jobs by 1991.

7.44 It was noted in paragraph 5.181 that there were a number of industrial estates on Teesside in 1965. They included three estates that had been established by the Board of Trade as part of the development area policy and are now managed by the Industrial Estates Management Corporation for England. These estates, listed in table 7.11, were almost fully developed at the time of survey, mainly for manufacturing industry although it will be noted that they were mainly female employing, and that the density of workers per acre varied greatly.

7.45 The estates also included four which were owned and managed by local authorities. They were being rapidly developed at the time of survey but almost exclusively by service industries in TIG 7. The location of these estates, near A1085 at Middlesbrough and Eston, between Stockton and Middlesbrough at Portrack, and, to a lesser extent, at Billingham, meets the locational requirements of many service industries, as was shown in chapter 5, and there has been no attempt by the local authorities to restrict their development to manufacturing industries.

7.46 Finally, it was noted that one Board of Trade estate, four local authority estates and one private estate, a total area of 425 acres, were being laid out with services and roads though, in fact, no industrial development had yet started at the time of survey in September 1965, though since that time factories have been established on several of the estates.

7.47 Therefore, only the last group of estates can be relied upon to provide a location for some of the 50,000 jobs to be attracted to Teesside by 1991 as part of the policy of developing the area. Two questions follow from this. The first is, how many of these jobs can be reliably predicted to locate on these four estates; and second, how many more estates will be needed to provide for the additional employment necessary by 1991, how large should they be, and where should they be located?

The density of employment on industrial estates

7.48 The records of the existing Board of Trade estates, given in table 7.11, offer little guidance in answering these questions. Each of these has a high proportion of female job opportunities whereas the aim of future policy should be to attract a high proportion of male jobs. Also, none of these estates makes adequate provision for car parking, a need likely to become greater if more of the jobs are for men. Finally, the range of densities on these three estates is great and a simple average could not be deduced from the data for use in predicting future employment on other estates to be developed on Teesside.

7.49 Various alternative, sophisticated methods of predicting future employment on estates were examined. They included estimates of workers per square foot of floorspace for different categories of industries; estimates of plot ratios, including the intensity of development of an estate by individual plots, and that of the plot by buildings, estimates of car parking requirements and the like. These methods, however, depend on fairly precise knowledge of the exact type of industry and future rate of growth of the firms attracted to a particular estate. But neither the mixture of industries, nor the amount of land needed by any industry at a particular stage of its development can be predicted. In particular, the significance of changes in productivity within a specific firm, and its requirements of land extensions, could not be measured.

7.50 A simpler, more general measure was required that would enable a forecast of future employment on an estate to be made solely in terms of the area of the estate and the staging of its development during the period to be covered by the urban structure policy, namely twenty-five years. Data were examined for sixty-seven estates in Great Britain established either as

Table 7.11. Board of Trade industrial estates, Teesside, March 1966

name and location	total area (acres)	employment		workers per acre
		total	percentage male	
North Tees, Stockton	32.4	920	30.4	28.2
East Middlesbrough	21.9	2,810	10.2	128.4
Skelton	28.3	420	16.0	14.8

Table 7.12. Analysis of industrial estates, Great Britain

group	number of estates	location	source of data
A	1	*Aycliffe New Town	I.E.M.C. England
B	15	North East England	„
C	3	Cumberland	„
D	3	Merseyside	„
E	21	Scotland	I.E.M.C. Scotland
F	2	*Bridgend, Wrexham	I.E.M.C. Wales
G	3	Wales	I.E.M.C. Wales
H	11	London new towns	M.H.L.G.
I	4	Cumbernauld	Cumbernauld New Town Corporation
J	4	East Kilbride	East Kilbride New Town Corporation

Notes: *, former Royal Ordnance Factories;
I.E.M.C., Industrial Estate Management Corporation.

part of development area policy or as part of the new towns programme. The full list of estates is given in table 7.12 and the relevant data were:

a total employment on an estate, annually at November, for 1955, 1960, 1961, 1962, 1963, 1964, 1965;

b gross area of the estate, in acres, including all private roads, car parks, amenity planting, and excluding only large areas of land incapable of development by reason of topography, subsidence, etc.;

c the year in which the estate was first provided with services, either completely or in part.

7.51 It was found to be a reasonable hypothesis to try to fit a simple curvilinear relationship between employment, age and area of an industrial estate by use of multiple regression analysis, the equation being of the form:

$$y = a + b_1x_1 + b_2x_2 + b_{12}x_1x_2 + b_{11}x_1^2 + b_{22}x_2^2$$

where y = total employment
x_1 = gross area − 100, in acres
x_2 = age of estate − 16, in years
a, b_1, b_2 etc. = constants, determined by the analysis

7.62 The goodness of fit of the resulting equation, that is the degree to which it accurately yields the employment on an estate given details of its area and age, is given by measuring the correlation between the observed employment collected for each estate in table 7.12 and that yielded by use of the equation. The following measures were used:

- R, the correlation coefficient;
- R^2, the proportion of the variability in observed data of employment that can be accounted for by variations in the age and area of the estates;
- *s.e.*, the standard error of the residual, measuring the degree of accuracy and reliability that can be placed on the predicted figure of employment for a particular estate.

By this last, it is meant that it is possible to be 88 per cent certain that the actual employment on an estate of near average age and size will lie within the range approximately defined by the predicted employment plus or minus the standard error, and about 95 per cent certain that it will lie within twice this range.

7.53 The results of the analysis are illustrated in table 7.13, which shows the values of R, R^2, *s.e.*, and the predicted employment for five different groupings of the data. From these results, for instance, the predicted level of employment after fifteen years on a 100 acre estate in North East England will be 4,719 ± 917; that is there will be a 68 per cent chance that it lies somewhere between 3,802 and 5,636; and a 95 per cent chance that it lies between 2,885 and 6,553.

7.54 A number of important features are illustrated in this table. The first is that the density of development could vary between thirty-nine and sixty-eight persons per acre, the former being the case if the estate is typical of Board of Trade estates in the development areas, the latter if it were a typical estate in a new town. This difference probably reflects more the attractions of a location near London and the faster rate of economic development in South East England than any inherent or substantial long-term difference between the two types of estate. At greater ages, the difference between the two types of estate is reduced.

7.55 A second factor concerns the accuracy of the predictions which in turn is related to the goodness of fit of the equation. The most accurate prediction is for the North East estates. This reflects their comparatively similar role and form of development, particularly if the one exceptional estate at Aycliffe is removed from the analysis. The least accurate prediction is for the full array of estates including as it does estates in very different types of location, set up to meet very different policies.

7.66 The equation best suited for forecasting employment on Teesside is that derived for I.E.M.C. estates in Great Britain, notwithstanding the problems of using national data for making sub-regional forecasts. The first reason for this choice is that the future role of estates on Teesside should be more similar to that of development area policy than for new towns. Secondly, the regional location of Teesside is akin to the estates provided by the I.E.M.C., rather than those located in new towns. Thirdly, the equation derived for estates in North East England is based on too few observations to be fully reliable, although it gives the most accurate predictions.

Table 7.13. Predicted employment on a 100-acre estate after fifteen years

category of estate	groups	number of estates	predicted employment	R	R_2	*s.e.*
Great Britain, all estates	A–C, E–J	64	4,386	0.80	0.84	±2,519
Great Britain, I.E.M.C. estates	B–E, G	45	3,910	0.92	0.84	±1,442
North East, all estates	A, B	18	4,719	0.97	0.94	± 917
North East, excluding Aycliffe	A	15	4,767	0.98	0.96	± 753
Great Britain, new towns	H–J	18	6,805	0.88	0.77	+2,430

Notes: groups, defined in table 7.12;
data for three estates not available at time of computing.

Table 7.14. Predicted employment on industrial estates at five-year intervals

area (acres)	age (years)	predicted employment	range of employment at 68 per cent confidence limits lower limit	upper limit
25	5	698	−685	2,080
50	5	1,349	− 45	2,742
75	5	1,929	518	3,336
100	5	2,435	1,004	3,861
125	5	2,867	1,411	4,317
150	5	3,223	1,738	4,702
175	5	3 501	1,978	5,014
200	5	3 599	2,135	5,252
225	5	3,816	2,204	5,415
250	5	3,849	2,184	5,498
275	5	3,797	2,073	5 505
300	5	3,658	1,867	5,429
325	5	3,429	1,566	5,270
350	5	3,108	1,167	5,025
25	10	599	−733	1,932
50	10	1,437	98	2,777
75	10	2,207	855	3,557
100	10	2,909	1,543	4,272
125	10	3.539	2,158	4,017
150	10	4,097	2,838	5,493
175	10	4,582	3,161	5,998
200	10	4,992	3 547	6,432
225	10	5,325	3 853	6,791
250	10	5,580	4,078	7,075
275	10	5,755	4,219	7,282
300	10	5,847	4,275	7 411
325	10	5,856	4,241	7,458
350	10	5,778	4,123	7 423
25	15	743	663	2,049
50	15	1,762	448	3,076
75	15	2,717	1,394	4,038
100	15	3,606	2,273	4,938
125	15	4,426	3,084	5,772
150	15	5 184	3 827	6,539
175	15	5,671	4,600	7,241
200	15	6,486	5,099	7,870
225	15	7,028	5,626	8,428
250	15	7,497	6,077	8,913
275	15	7,890	6,453	9,323
300	15	8 206	6,751	9,656
325	15	8,444	6,970	9,914
350	15	8,601	7,107	10,080
25	20	1,115	−168	2,400
50	20	2,310	1,019	3,601
75	20	3,445	2,145	4,743
100	20	4,517	3,209	5,824
125	20	5,527	4,208	6,844
150	20	6,473	5,143	7,800
175	20	7,353	6,012	8,692
200	20	8,165	6,813	9,517
225	20	8,914	7,549	10,274
250	20	9,589	8,212	10,966
275	20	10,193	8,804	11,580
300	20	10,726	9,325	12,123
325	20	11,182	9,773	12,591
350	20	11,565	10,147	12,981
25	25	1,704	431	2,978
50	25	3,070	1,793	4,347
75	25	4,379	3,096	5 661
100	25	5,630	4,339	6,919
125	25	6,820	5,520	8,119
150	25	7,951	6,640	9,260
175	25	9,019	7,698	10,340
200	25	10,025	8,690	11,368
225	25	10,968	9,618	12 311
250	25	11,841	10,481	13,199
275	25	12,650	11,278	14,020
300	25	13,395	12,011	14,777
325	25	14,066	12,671	15,457
350	25	14,663	13,262	16,064
25	30	2,501	1,200	3,803
50	30	4,031	2,733	5,330
75	30	5,509	4,209	6,809
100	30	6,932	5,627	8,238
125	30	8,258	6,956	9,609
150	30	9,608	8,285	10,828
175	30	10,859	9,525	12,191
200	30	12,050	10,702	13,395
225	30	13,181	11,818	14,541
250	30	14,250	12 871	15,628
275	30	15,256	13,881	16,647
300	30	16,197	14,787	17,604
325	30	17,073	15,648	18,498
350	30	17,882	16,443	19,319

7.57 The final equation, therefore is:

$$y = 3{,}910 + 35.1(x_1 - 100) + 189.4(x_2 - 15) - 0.1(x_1 - 100)^2 + 1.7(x_1 - 100)(x_2 - 15) + 5.3(x_2 - 15)^2$$

where y = employment
x_1 = area, in acres
x_2 = age, in years

7.58 The results from this equation were modified for one further factor whose influence had not entered the regression analysis but whose future effects were likely to be important and which could be given numerical expression. This factor is car parking. Data on travel-to-work on industrial estates is limited but figures for 1965 in the North East ranged between 18 per cent of all workers travelling by car to Pallion Estate, and 39 per cent to Aycliffe, with 24 per cent travelling by car to the largest estate, at Team Valley. Assuming a ratio of 1.5 persons per car, this data suggests that, at the present time, parking provision has to be made for a number of cars equal to about 17 per cent of the total employment. Predictions of future car ownership and modal split on Teesside suggest that this ratio should be about 60 per cent by 1991.

7.59 Thus predictions obtained from the equation given in paragraph 7.57 have to be adjusted to allow for the greater provision for car parking. The adjustment was made by an iterative procedure. Given a predicted employment figure, it was assumed that additional space would be required for cars equal to 33 per cent of the employment at a standard of 300 square feet per car. The given area of the estate was reduced by this total additional requirement for car parking, and a new prediction made of the employment on this smaller estate. The process was repeated until the predictions converged, giving an adjusted prediction of employment on an estate making reasonable allowance for the greater provision of space for car parking.

7.60 The final results are given in table 7.14, showing the predicted employment and the likely range of forecast at a 68 per cent level of confidence for estates between 25 and 350 acres in size at five-year intervals. The results will be most reliable for estates of near average age and size.

7.61 An extract from the main table of results is given in table 7.15, showing the likely growth of employment at five-yearly intervals on an estate of 125 acres established in 1966. It shows that the density of employment can be predicted to rise from 22.9 persons per acre by 1971, to 54.6 persons per acre by 1991. A further extract, given in table 7.16, shows the predicted employment after fifteen years on a range of estates varying in size between 50 and 300 acres. This shows a much narrower range of predicted densities, between 27.4 and 36.2 persons per acre. The clear implication is that age is of much greater significance as a determinant of density than is size. Indeed, the size of an estate begins to have a noticeable effect on density only when it exceeds 200 acres.

Table 7.16. Predicted employment on estates of varying size, after fifteen years

size (acres)	predicted employment	predicted density (workers per acre)
50	1,760	35.2
75	2,720	36 2
100	3,610	36.1
125	4,430	35.4
150	5,180	34 8
200	6,490	32 4
250	7,500	30.0
300	8,210	27.4

The size and number of industrial estates

7.62 The prediction of future employment on estates also has implications for the optimum size of an industrial estate. There is evidence to suggest that an estate should provide more than 3,000 jobs to justify the provision of good access by road and public transport, but less than 10,000 jobs if the road system is not to be overloaded at peak levels. Using one-sided confidence limits, after thirty years an estate has to be 55 acres in size for there to be an 84 per cent probability of it having at least 3,000 workers; and 132 acres for a similar probability of it having no more than 10,000 workers.

7.63 This range of between 55 and 132 acres is confirmed from other sources. A report, *Physical Planning of Industrial Estates* (United Nations, 1962), refers to general experience in Great Britain which establishes that about 50 acres should be its minimum size if full services are to be provided economically, and that no benefits accrue if the estate is larger than about 150 acres. Other evidence also points to about 100 acres being an optimum size for the management of an industrial estate.

7.64 Finally, the confidence limits and predicted ranges of employment refer to a forecast for a single industrial estate. The problem at Teesside, however, is to develop several industrial estates which together provide a minimum level of employment opportunity. It is not correct in these circumstances for the standard error for each estate to be added together to give a range of prediction for the complete group of estates. Rather, the difference between the sum of the mean predictions for a number of estates, n, and the lower confidence limit on the total prediction is of the order, $\sqrt{n}\cdot s.e.$ Thus, to have a 95 per cent level of confidence that total employment on all estates will be greater than a minimum figure, this minimum prediction is given by

$$y' = \bar{y} + 1.65\ \sqrt{n}\cdot s.e.$$

where y' = minimum prediction of total employment on all estates
$\bar{y}$ = the sum of the mean predictions of employment on each estate
n = number of estates
$s.e.$ = standard error of the residual.

This calculation becomes of great importance in deciding upon the number of estates to be provided as part of urban structure policy, assuming each of these

Table 7.15. Predicted employment on a 125-acre estate, 1966–91

date	predicted employment	range	predicted density (workers per acre)
1966 (date of establishment)	0	0	0
1971	2,870	1,410–4,320	22.9
1976	3,540	2,160–4,920	28 3
1981	4,430	3,080–5,770	35.4
1986	5,530	4,210–6,840	44 2
1991	6,820	5,520–8,120	54.6

estates is of the optimum size between 55 and 132 acres.

Employment on committed estates on Teesside

7.65 The proceding analysis and method of predicting future employment on industrial estates can now be applied to Teesside, to determine the minimum employment likely on the five committed industrial estates and, therefore, the number and size of additional estates which will be required to ensure that sufficient land is available for light manufacturing industry. The calculation takes the following sequence:

a enough estates must be made available for there to be 95 per cent confidence that total employment on the estates will be not less than 50,000 by 1991;

b thus the sum of the mean predictions of employment for all industrial estates is given by

$$\begin{aligned}\bar{y} &= y' + 1.66\sqrt{n}\cdot s.e.\\ &= 50{,}000 + 1.65\sqrt{12}\cdot 1{,}303\\ &= 57{,}446\end{aligned}$$

where the minimum prediction of employment on all estates is not less than 50,000, at 95 per cent level confidence; and *s.e.* = 1,303, the value of the standard error adjusted for higher car parking standards, as in paragraph 7.59.

7.66 The five committed estates are listed in table 7.17, together with a prediction of the mean employment after twenty-five years, that is by 1991. The table also gives an estimate of the minimum employment on each estate. Strictly, the minimum prediction for a specific estate can be derived only by full application of the regression formula, that is the figures given in the full table of results (table 7.14). However, it is necessary for the transportation analysis that there be only a single prediction, not a range, for each estate and that the sum of these predictions be equal to the total required employment. Therefore, an arbitrary method has been used to give the values in table 7.17. The assumed minimum prediction = 0.87 × the mean prediction, that is the ratio of the sum of the mean and the minimum predictions (50,000 – 57,446).

Location and size of additional estates on Teesside

7.67 The five committed estates provide for a reliable minimum employment of 28,140; therefore, the additional estates, about seven in all, will have to provide for at least 21,860 jobs by 1991. The final step is thus to select the best locations for these estates, with the aim of minimising travel-to-work, by providing as widely distributed a pattern of employment as possible. But the location of these estates should also recognise the requirements of manufacturers, described in chapter 4.

7.68 The key figures are given in the last three columns of table 7.18. They show the surplus or deficit of employment opportunity in each of the fourteen districts of Teesside at three successive states:

a the difference between the number of workers living in a district by 1991 and the number of jobs likely as a consequence of autonomous growth of manufacturing industry and services;

b the additional effects of the growth of employment on the committed industrial estates, Seal Sands and Bowesfield Lane;

c the additional effects of the committed and the recommended industrial estates.

7.69 If the aim is to minimise long distance travel-to-work, and therefore to reduce the size of the surplus or deficit of employment over workers in each district, it is clear that the location of the committed industrial land is of little obvious assistance. Most of this land, except at Redcar and Eaglescliffe, is in districts that already have a surplus of employment opportunity because of the autonomous growth of existing activities and the reduction in population through urban renewal and rehabilitation.

7.70 The need for further industrial estates can therefore be argued as follows:

a Thornaby industrial estate, the new district centre and the Bowesfield industrial development together create a substantial surplus of employment in districts 2 and 3 which, however, is roughly equal to the deficit in the adjacent areas of Eaglescliffe, Yarm and Ingleby Barwick. Thus, these three districts (2, 3 and 8), can be regarded as being in balance, provided that adequate communications are created. The only additional need in district 8 is a longer term requirement for an estate in the south of the district, to give a more balanced distribution of female opportunities.

b The substantial deficit in district 7, at Nunthorpe, Marton and Hemlington, is also offset by the surplus of employment in Middlesbrough and Eston. Nevertheless, this would be a suitable district for two longer term estates, partly to serve the local needs, but equally, to create a higher level of employment opportunity which is likely to have favourable effects as far afield as in Guisborough and East Cleveland (see chapter 12). This district, crossed by A172, is also probably the furthest east that would still meet the main transport requirements of industrialists.

c The needs of districts 11 and 12 for more employment opportunity are much more apparent and much more difficult to satisfy, because of their relative distance from the main entry routes to Teesside, the A19, A172 and A66 roads. Three estates should be provided in this area, including an extension to the existing estate at Skelton. These could give enough employment to maintain travel-to-work out of the districts at about its 1965 level.

Table 7.17. Committed industrial estates, Teesside, 1965

coarse zone (1991) system	estate	area (acres)	prediction employment at twenty-five years, 1991	
			mean	assumed minimum
Industrial Estate Management Corporation for England:				
68	Thornaby	336	14,329	12,470
local authorities:				
18	Billingham	104	5,920	5,070
53	Redcar	35	2,250	1,950
59	Sedgefield	30	1,977	1,720
private:				
65	Eaglescliffe	150	7,951	6,920
TOTAL		665	32,327	28,140

Table 7.16. Analysis of the distribution of employment opportunity, Teesside, 1991 ('000's)

district	resident workers	residual employment		surplus/deficit of opportunity		
		committed	recommended	autonomous	committed	recommended
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Middlesbrough	52.5	0	0	+13.2	+13.2	13.2
2. Stockton	37.1	3.1	0	+ 2.0	+ 5.4	5.4
3. Thornaby	10.8	12.5	0	+ 3.8	+16.1	16.1
4. Billingham	31.2	10.1	3.1	− 1.3	+ 8.8	11.9
5. Eston	19.3	0	0	+27.3	+27.3	27.3
6. Redcar	18.8	2.0	0	− 7.6	− 5.6	− 5.6
7. Nunthorpe–Marton	42.4	0	7.2	−28.4	−28.4	−21.2
8. Eaglescliffe–Yarm	43.9	6.9	4.0	−24.4	−17.5	−13.5
9. Stillington	1.5	0	0	− 0.3	− 0.3	− 0.3
10. Sedgefield	4.4	1.7	0	− 2.0	− 0.3	− 0.3
11. Saltburn–Marske	13.1	0	3.0	− 9.8	− 9.8	− 6.8
12. East Cleveland	11.3	0	4.4	− 7.5	− 7.5	− 3.1
13 Guisborough	8.9	0	0	− 5.0	− 5.0	− 5.0
14 Stokesley	8.9	0	0	− 5.8	− 5.8	− 5.8
sub-total, 1–6, urban	169.6	27.6	3.1	+37.5	+65.2	+68.3
sub-total, 7–14, rural	134.4	8.6	18.7	−83.2	−74.6	−56.0
TOTAL (rounded)	304.1	36.2	21.8	−45.8	− 9.4	+12.4

Notes: column (2): resident workers, by application of local activity rates to forecast population (see chapter 2):
column (3), (4): the residual industrial employment to be provided: column (3) includes the five committed estates, Seal Sands and the Sowesfield Lane area;
column (5), (6), (7): the difference between the number of jobs forecast for a district at successive stages, and the resident work force: column (5) is for the predicted autonomous growth only; column (6) also includes the committed estates: column (7) also includes the remaining estates and is therefore the final forecast;
the total in column (7) is as follows.

resident workers	304,100
unemployed	− 4,600
net travel-to-work	+17,000
total employment	316,500
surplus	+12,400

Table 7.18. Recommended additional industrial estates, Teesside

coarse zone (1991 system)	estate	date of development	area (acres)	predicted employment, 1991	
				mean	assumed minimum
12	Nunthorpe	*c.* 1976	108	3,869	3,370
19	Wolviston	*c.* 1976	100	3,606	3,140
38	Crathorne	*c* 1976	132	4,646	4,040
43	Hemlington	*c* 1976	125	4,429	3,850
55	Marske	by 1971	75	3,446	3,000
57	Skelton	by 1971	60	2,784	2,410
57	Loftus	by 1971	50	2,310	2,010
TOTAL (rounded)			650	25,089	21,820

Note: Skelton excludes existing estate.

Table 7.25. Distribution of employment opportunity, Teesside, 1991 ('000's)

district	employment			resident workers			surplus/deficit		
	male	female	total	male	female	total	male	female	total
1 Middlesbrough	33.5	32.2	65.7	33.5	19.0	52.5	0	13.2	13.2
2. Stockton	25.9	16.6	42.5	24.4	12.7	37.1	1.5	3.9	5.4
3 Thornaby	21.0	5.9	26.9	7.1	3.6	10.8	13.9	2.2	16.1
4 Billingham	33.6	9.5	43.1	20.7	10.5	31.2	12.9	− 0.9	11.9
5. Eston	39.5	7.0	46.5	13.1	6.2	19.3	26.5	0.8	27.3
6 Redcar	6.8	6.4	13.2	12.3	6.5	18.8	− 5.5	− 0.1	− 5.6
7. Nunthorpe–Marton	13.8	7.4	21.2	28.5	13.8	42.4	−14.7	− 6.5	−21.2
8 Eaglescliffe–Yarm	22.7	7.6	30.4	29.7	14.2	43.9	− 7.0	− 6.5	−13.5
9. Stillington	0.9	0.3	1.2	1.0	0.5	1.5	0.1	− 0.2	− 0.3
10. Sedgefield	2.4	1.8	4.2	2.7	1.7	4.4	− 0.2	0.1	− 0.3
11. Saltburn–Marske	4.3	2.0	6.3	8.9	4.2	13.1	− 4.6	− 2.2	− 6.8
12 East Cleveland	5.7	2.5	8.2	7.7	3.6	11.3	− 1.9	− 1.1	− 3.1
13 Guisborough	1.9	2.0	3.9	6.0	2.9	8.9	− 4.1	− 0.9	− 5.0
14. Stokesley	2.0	1.1	3.2	6.0	2.9	8.9	− 4.0	− 1.7	− 5.8
sub-total, 1–6, urban	160.5	77.6	238.0	111.1	58.5	169.6	49.3	19.0	68.3
sub-total, 7–14, rural	53.8	24.7	78.5	90.6	43.8	134.4	−38.9	−18.1	−56.0
TOTAL (rounded)	214.2	102.3	316.5	201.7	102.4	304.1	12.5	− 0.1	12.4

d Finally, the apparent substantial surplus of opportunity in the Billingham district (which includes the proposed Wolviston residential area) should be regarded with caution. Firstly, the likely direction of future net inward travel-to-work from areas outside Teesside makes it probable that a substantial number of these 17,000 workers will seek jobs in Billingham, thus reducing the surplus. Secondly, a very high proportion of the jobs are for male blue-collar workers in heavy industry. The district is the only part of the inner core of urban Teesside that has a deficit of female jobs. For these reasons, a further estate should be located near Wolviston.

7.71 The exact location of these additional estates was settled as part of urban structural policy and the district feasibility studies reported in Volume I. The details of the estates are given in table 7.19 and it was taken that 10 per cent of the jobs on all the estates, committed and additional recommended, were likely to be female.

7.72 The final pattern of employment opportunity likely by 1991 is shown in table 7.20, showing the distribution of male and female employment and the numbers of workers living in each district.

The pattern of change, 1965–91

7.73 The predominant characteristic of Teesside's distribution of employment in 1965 was its concentration in a very few coarse zones. Thus it was noted in table 7.3 that 30 per cent of all employment in manufacturing was located in only two coarse zones; and even for services, 30 per cent of the total employment was located in only four zones. The comparable table for 1991 (table 7.21) shows that this extreme degree of localisation will probably have been reduced only slightly. However, it is possible that there will be a wider dispersal of employment by 1991. That is, whereas 70 per cent of manufacturing employment was concentrated in six zones in 1965, it will be spread over eleven zones by 1991. The preceding analysis of the distribution of autonomous and committed increases in employment shows that there is little that can be done to accelerate this trend.

7.74 Nine zones will be the main locations of employment in 1991, each containing more than 10,000 jobs. But the identity of these major centres of employment is likely to differ from the major centres in 1965, listed in paragraph 7.13. Middlesbrough central area is likely to become the largest single zone, by a wide margin. Three formerly important industrial zones in north Middlesbrough (namely, Ironmasters, North Ormesby and the periphery of the central area) are likely to become much smaller centres of employment, and three new zones are likely to become some of the largest centres of employment on Teesside: the new industrial area at Eaglescliffe; and the areas of new development at Thornaby and Hemlington, containing industrial estates, district centres, secondary school bases and, for the latter, a district hospital. The nine zones with the greatest employment by 1991 are thus likely to be:

1	Middlesbrough	29,000	jobs	central area
13	Cleveland–Lackenby	24,000	,,	steel
21	Billingham	17,000	,,	chemicals
51	Wilton	16,000	,,	chemicals
28	Stockton	13,000	,,	central area
68	Thornaby	13,000	,,	light industry, services
66	Eaglescliffe	11,000	,,	light industry
39	Hemlington	10,000	,,	light industry, services
53	Redcar	10,000	,,	central area

7.75 It is significant, however, that this wider degree of dispersal is essentially confined to within urban Teesside, that is districts 1–6. This area contained 88 per cent of total employment in 1965 and will still contain 75 per cent by 1991, roughly the same ratios holding for both male and female employment (see table 7.22).

Table 7.21. Degree of localisation of employment, Teesside, 1991

	manufacturing and extractive	services	total	male	female
number of coarse zones that together contain more than thirty per cent of total employment in the category on Teesside	3	4	9	8	5
,, ,, more than fifty per cent	6	11	11	10	10
,, ,, more than seventy per cent	11	23	20	18	21

Table 7.22. Pattern of distribution of industrial groups, Teesside, 1965–91

	percentage of total employment in each TIG					
	1965			1991		
Teesplan Industrial Group	urban core	new urban	rural	urban core	new urban	rural
1. Chemicals	98	1	1	97	2	1
2. Metal manufacture	91	0	8	98	0	2
3. Engineering and shipbuilding	97	2	1	82	15	3
4. Other manufacture	84	3	13	88	3	9
new manufacturing	–	–	–	53	31	16
5. Retail distribution	90	2	8	80	14	6
6. Central services	84	5	11	84	8	8
7. Non-personal services	89	5	6	73	22	5
8. Health and education	74	6	20	58	27	15
9 Agriculture and extractive	10	16	74	10	22	68
TOTAL (rounded)	88	3	9	75	16	8
male	88	3	9	75	17	8
female	86	3	11	75	15	10
population	79	8	13	55	29	16

Note: urban core, districts 1–6;
new urban, districts 7, 8;
rural, districts 9–14.

The weight of committed and existing investment in industry, services and their infra-structure means that dispersal of employment on the same scale as that of housing is just not possible, and inward travel to work from the outer districts will increase substantially.

7.76 The impact of possible closures of smaller works and the committed and autonomous development together mean that any dispersal of manufacturing employment outside the urban core is unlikely. The only exceptions are in the new urban areas where engineering developments at Urlay Nook, and the new industrial estates make possible some dispersal. The central services are likely to remain localised within the urban core because of the policy for fostering the growth of Middlesbrough as a regional centre for Teesside and because of the locational requirements of these activities. The remaining activities are more likely to be dispersed in relation to the pattern of population distribution although that for non-personal services includes the temporary construction workers building the new residential areas.

7.77 The distribution of future female employment opportunities requires more detailed treatment. The proportion of female jobs in each of the fourteen districts is likely to alter only to a small degree, with reduced proportions in Middlesbrough and Stockton, and greater proportions in the new residential districts. But the district is too broad a tract for effective analysis of female employment and even within the district the differences in the redistribution of population are likely to create problems for female opportunities.

7.76 The first problem is the degree to which female employment is more localised than male, both in 1965 and, as seems likely, in 1991. The two central areas are the source of this localisation and, although the general dispersal of service employment will reduce this dominance, the sex ratio of jobs in the centres will rise from 47.4 per cent in 1966 to 50.1 per cent female in 1991 (see table 7.23). This is a consequence of the policy of developing the regional centre.

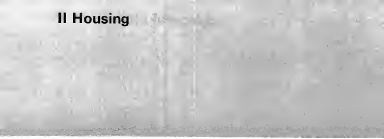
7.79 The second problem is that within urban Teesside there are several local pockets of very restricted opportunity for female work, where less than a third of the women likely to be seeking work can find it within their coarse zone of residence. This applies to the interwar and postwar housing areas west of Stockton, at Fairfield and Hartburn (coarse zones 30 and 31); and south of Middlesbrough, at Acklam and Berwick Hills (coarse zones 7 and 9). It applies, too, in the proposed areas of future development south of Middlesbrough, at Ormesby and Marton (coarse zones 11, 45 and 46); at Ingleby Barwick (coarse zone 36); and Wynyard (coarse zone 70). To some extent, this deficiency is more apparent than real in the cases of Hartburn, Acklam, Ormesby and Marton as these are higher income areas where activity rates are likely to be relatively low. But there are strong arguments for ensuring good public transport services from the other areas to central Stockton and central Middlesbrough and, for the more distant zones at Wynyard and Ingleby Barwick, a case for introducing further female employment. Finally, the surplus of female labour, the environment and the situation of the Marton–Ormesby area makes it a suitable alternative location for major new office development to that at central Middlesbrough.

Table 7.23. Sex ratios of employment in central areas, Teesside, 1965–91

	central Middlesbrough		central Stockton	
	1965	1991	1965	1991
employment, male	16,460	22,600	7,410	9,720
female	15,910	23,540	5,970	8,930
percentage of employment, female	48.6	50.9	44.6	47.9
percentage of Teesside employment, male	11.9	10.6	5.2	4.6
female	26.6	23.0	10.7	8.7

Note: definitions, see table 7.6.

II Housing



8 Household forecasts

The household forecasts

8.1 This chapter gives forecasts of the number and size of potential private households in the Teesside Survey Area to 1991. It is assumed as a policy that one household should have a dwelling and so the forecasts are also a basis for estimating the future need for dwellings.

8.2 The method of forecasting is based broadly on the technique currently used by the Ministry of Housing and Local Government and uses data kindly provided by the Ministry's Statistics Branch.

8.3 The basic method used by Teesside Survey & Plan was as follows:

a prepare a marital status forecast of the population forecast, in terms of 'married', 'single', and 'widowed or divorced' males and females;

b for the married persons assume that the number of households formed by married persons equals the number of married couples;

c for the non-married (i.e. single and widowed or divorced) persons, the number of households formed is estimated by applying appropriate 'headship rates' to the forecast non-married population broken down into large age–sex–marital status groups (a headship rate is the proportion of persons in an age–sex group who are heads of households). This part of the calculation required assumptions to be made about future headship rates for non-married persons. Because of uncertainties two sets of assumptions were made, though their effects are fairly small.

8.4 The forecast of households to be formed by married couples is based on a simple standard of housing need, that one household of married persons should have one dwelling.

8.5 The forecasts of households formed by persons in non-married age–sex–marital status groups are not a simple forecast of housing need, because there are no easily defined standards for non-married persons, especially single persons. These forecasts assume that non-married persons, particularly single persons, will in future wish to form households to a greater extent than at present; that is, there will be pressure for non-married headship rates to rise, and that this demand will be met. Two sets of assumptions were made about how rates may rise in future, based on past trends in local and national household formation by non-married persons.

8.6 It has to be recognised that the forecasting technique used, though considered to be the best available, is fairly crude. Past data on headship rates are very limited and are available only for very large age–sex–marital status groups; no time series of rates are available. Past rates for non-married persons are likely to be affected by the condition of the housing supply market to an unknown extent. There are many uncertainties about future household 'fission', that is the tendency for single people, and others, to leave their original home to form a new household. Moreover the forecasts depend on a forecast of marital status which has to be very simple because no data are available for making sophisticated forecasts for Teesside.

8.7 In view of this the results can only be regarded as rough estimates of the number of households likely to be formed up to 1991. This is important, because household forecasts are much more significant than the population forecasts in determining the amount of land needed for 1991 planning.

8.8 The results for the Teesside Survey Area are given in table 8.1. This forecast is based on the final working forecast of the population of Teesside, given in chapter 1. It may be subject to error from three sources: the rate of natural increase, the scale of net migration, and the rate of change of headship rates for non-married persons.

Table 8.1 Summary of forecast of households, Teesside, 1961–91

	1961	1966	1976	1991
high assumption	139,000	147,000	169,000	213,000
low assumption	–	–	167,000	209,000

8.9 Because of uncertainty about future rates of natural increase, a range of six assumptions was made in the Teesside population forecasts, relating to possible future levels of fertility rates. The effect of this range of assumptions on the total number of households formed is small: natural increase forecast AX plus the migration forecast gives 214,000 households at 1991 on the high assumption about headship rates, and the corresponding figure for natural increase forecast CY is 212,000, giving a range of less than 1 per cent. This is because few of the persons born in the period before 1991 will have reached the household formation age by 1991.

8.10 The possible range of future fertility rates has, however, a most significant effect on average household size, given by dividing the number of households into the population (see table 8.2). The national implications of this issue of household size were examined in D.V. Donnison's *The Government of Housing* (1967). They concerned mainly the supply of houses of different sizes. Further reference is made to this issue later in this chapter and in chapter 10.

Table 8.2. Variation in forecasts of household size, Teesside, 1991

	population	persons per household
1966	478,870	3.34
1991 final population forecast		
high headship rates	703,830	3.31
low headship rates	703,830	3.37
1991 alternative forecasts		
high population forecast (AX + migrants)	729,400	3.40
1991 low population forecast (CY + migrants)	667,200	3.15

8.11 The second issue is the effect of possible changes in the scale of migration. The migration component in the final population forecast is based on the Northern Economic Planning Council's population policy for the Northern Region and Teesside, but uncertainties about future economic development make it possible that future net inward migration might be at a slower or faster rate, and indeed the direction of net movement could be reversed. The Council's assumption for Teesside represents a considerably higher rate of migration than that achieved in the recent past and, if anything, is optimistic. Therefore, the migration component of the final population forecast is less certain than the component comprising the natural increase of the native population and this must be borne in mind.

8.12 Estimates have been made of the likely scale of household formation by the migrant population. These are rather artificial as the migrant and native population would be integrated; and very approximate, because the unbalanced age–sex structure of the migrant population would produce unusual household formation characteristics. They indicate however the significance of the uncertain migration element in the total household forecasts. On the assumed rates of migration there would be about 18,000 migrants households by 1991, and much more significant, migrants households would form a very large proportion of the quinquennial increase in the total number of households from 1971 onwards.

8.13 The third issue, which should be reviewed when 1966 and 1971 Census data are available, is headship rates among single and widowed and divorced persons. Two assumptions were made about future changes in headship rates for these forecasts. The assumptions cover quite a wide range of possible change, but their effect on the forecast of households at 1991 is comparatively small: the high assumption gives 212,700 households, the low assumption 208,600.

8.14 However, the forecasts are based on 1951 headship rates and should be reviewed as soon as possible for this reason alone. But there are indications from the Home Interview Survey that these headship rates may be rising more rapidly than even the high assumption allows. This information from the Home Interview Survey is not conclusive, because the Survey did not break down marital status farther than a simple division between married and non-married persons, and because of possible sampling errors, but it suggests that the high forecast should be used in making calculations of housing need, and that the matter should be reviewed when new data are available.

Methods of forecasting

Definitions

8.15 *Headship rate:* this is the percentage of persons in a given age–sex–marital status group who are heads of households. A more precise definition depends on the definition of 'households' and 'age–sex–marital status groups'.

8.16 *Household:* this relates only to private households and the forecast is in terms of 'potential' households as defined by the Ministry of Housing and Local Government. These are not simply the enumerated private households of the Census of Population. They also include hidden households, groups of persons listed as members of a household according to the Census definition of a household, but who would be likely to want separate accommodation if it were available within their means. They comprise 'family nuclei', i.e. a husband and wife with or without children or a lone parent accompanied by children. The Ministry's definition of potential households however excludes 75 per cent of one-person households in shared dwellings; they are mainly lodgers considered unlikely to want separate accommodation.

8.17 *Age–sex–marital status groups:* twelve age–sex–marital groups are used in the forecasts:

male and female, aged 15–39, married
male and female, aged 40–59, married
male and female, aged 80 and over, married
male and female, aged 20–39; single, widowed, divorced
male, aged 40–59; single
male, aged 40–59; widowed, divorced
male, aged 60 and over, single
male, aged 60 and over, widowed, divorced
female, aged 40–59, single
female, aged 40–59, widowed, divorced
female, aged 80 and over, single
female, aged 60 and over, widowed, divorced.

8.18 *Family:* a family, according to the definition in the Census of Population, 1961, is a married couple living alone or with their never-married child(ren) of any age. A family may also be a lone parent with his or her never-married child(ren).

Household forecasting technique

8.19 The method of forecasting future numbers of households, currently used by the Ministry of Housing and Local Government is as follows:

a calculate 1951 headship rates, on 1961 Census family definition, for twelve age–sex–marital status groups;

b apply the 1851 rates to 1861 Census data on age–sex–marital condition and compare the estimated total number of households with the total given in the 1961 Census. In most areas, including Teesside, the 1951 rates underestimate 1961 total households by a small percentage. This percentage is called 'drift';

c a forecast is made of the future population broken down into the twelve age–sex–marital status groups. This is done by assuming that the 1961 age–sex-specific marital status rates will apply at the forecast dates;

d the forecast of future households is then made by applying the 1951 headship rates to the forecast population by age–sex–marital status groups, and scaling up the resulting estimate of total households by a 'drift factor'. This takes account of the fact that headship rates have risen between 1951 and 1961 in most areas, and assumes that this trend will continue. Drift factors used in the past are:

for 1971, 1.738 × 1951–61 per cent drift,
for 1981, 2.000 × 1951–61 per cent drift

8.20 It is clear that this technique has the following weaknesses, due to limitations in the available data.

a Age–sex–marital status specific headship rates for only one year are used when obviously it would be better to have available a time series of rates for forecast purposes. This situation is unavoidable: age–sex–marital specific data are available for 1951 and 1961 but the data are not comparable because different age groups were used in the two Censuses. Therefore all that can be done is to use 1961 rates and the general indication of changes 1951–61 given by the drift calculation. The extrapolation of the drift for 1951–61 on this basis is of course bound to be a very crude exercise. When 1966 Census data are available it may be possible to extrapolate 1961–66 trends in individual age–sex–marital status rates.

b The marital status forecasts are fairly crude. This too is unavoidable since no official local marital status forecasts are available and indeed there is no data generally available from which such forecasts could be made. The forecasts assume basically that 1961 marital status rates apply in future. This is a fairly sound assumption, and comparison of an England and Wales marital status forecast made using constant 1961 rates, and the Registrar General's marital status forecast for England and Wales, made in 1964, indicate that the method gives a reasonably reliable estimate of the total number of married persons (see table 8.3). However, the assumption conflicts with the Registrar General's national assumption that marriage rates in the youngest age groups will rise in future. Although the effect of this assumption is not very great, relatively, it would seem logical to allow for a rise in marriage rates.

Table 8.3. Marital status forecasts, England and Wales ('000's married females)

age group	1971		1961	
	forecast A	forecast B	forecast A	forecast B
15–39	5,622	5,669	6,190	6,567
40–59	5,373	5,634	5,113	5,522
60 and over	2,504	2,864	2,614	2,973
TOTAL	13,499	14,167	13,917	15,062

Notes forecast A, application of 1961 five-year age-specific marriage rates to forecast total female population;
forecast B, Registrar General's marital status forecast for 1964.

c The age-spans used in the headship rates are very broad and this is bound to introduce substantial margins of error. It is possible, for example, that 1951–61 drift for some areas may be due not to changes in household formation but purely demographic changes, that is in the balance of population within the large headship status groups. Nothing can be done about this fact because the broad age spans used are the only ones available as yet from the Census.

d There is very little data available on which to base the drift factors for future dates, since there is no time-series of past drift. This situation will begin to be remedied when data from the 1966 Census is available. The assumption quoted in paragraph 8.19 is that drift will occur at a declining rate in future, but evidence from the Home Interview Survey suggests that the rate of drift may be increasing.

8.21 A conceptual weakness of the method described in paragraph 8.19 is that it is questionable whether there is any value in using headship rates to forecast married persons' households, when a simpler method is available, namely, to assume that the number of married persons' households equals half of the total of married persons from the household forecast, since by definition a married couple comprises a potential household. To test this, the 1951 headship rates for Teesside were applied to the population at forecast dates. For some dates this gave a small surplus of households over the hypothetical number of married couples (married persons divided by two), while for other dates there was a small deficit.

8.22 Nevertheless there is a theoretical objection to the simple method, that the number of households of married persons will not exactly equal half of the total of married persons. For instance a small number of married persons will live apart from their spouses. Thus in England and Wales at 1961 the Census revealed 239,000 households of such persons, as against 11,500,000 households of married couples. But the 239,000 includes the wives of seamen and forces overseas. On Teesside at 1951 the number of married persons' households almost exactly equalled half the married population, and from the Home Interview Survey this appears to apply also at 1966. On this basis, and remembering the crude nature of other parts of the household forecasting method, it seems reasonable to use the simple assumption rather than headship rates to forecast married persons' households. It could be argued that the size of the category of married persons living apart from their spouses may change in future, but this leads to the related question of drift.

8.23 A second conceptual weakness in the forecasting method is whether or not the drift factor should be applied to the total households forecast. There seems to be a good case for applying the drift factor only to the non-married population. Although there is little evidence available it seems likely that future drift will be very largely due to a rise in non-married persons headship rates. It is understood that the key feature in the drift for England and Wales between 1951 and 1961 was the rise in headship rates of non-married persons. Evidence from the Home Interview Survey indicates that the same situation applied on Teesside between 1951 and 1966. Household 'fission' is a phenomenon of these years. Increasing prosperity and changing social patterns have led to large numbers of single, widowed and divorced persons, especially young persons, setting up their own households. There has been no comparable increase in the number of households of married persons living apart from their spouses.

8.24 On general arguments there seems to be no reason to suppose that this past pattern will change in future. It may be that the number of married persons forming households separate from their spouses may increase, since rising living standards make this possible, but any change is likely to remain small compared with changes for non-married persons. Therefore it seems logical to apply the drift factor to non-married persons only.

8.25 The Ministry of Housing and Local Government are reviewing existing methods of household forecasting at the present time, using a large amount of new statistical information. For example the new data from the 1966 Census will make possible the development of an improved methodology for household forecasting. However, the method of forecasting used in this chapter is based on the existing method used by the Ministry of Housing and Local Government, (described in paragraph 8.19), but with four modifications:

a separate forecasts were made for married and non-married households. For married persons' households it was assumed that the number of households at a forecast date equalled half of the married persons forecast by the marital status forecasts. For non-married persons, headship rates were used;

b no drift factor was applied to the forecast of married persons' households;

c for non-married persons a range of assumptions was made about future drift of headship rates. A range is necessary first because past trends in drift can only be estimated approximately and second because the extrapolation of these trends is also uncertain;

d in making marital status forecasts it was assumed that marriage rates will rise among young persons.

The net effect of these changes on the forecasts of total households is relatively small, but it is considered that the modifications are reasonable.

Forecast of the number of households

Marital status forecast

8.26 A marital status forecast has to be made for all but the most rudimentary kinds of household forecasting. But the marital status forecast itself is inevitably crude, because official marital status forecasts are available only for England and Wales and there are no adequate data on which local forecasts can be made. Forecasts available for England and Wales cannot be applied to Teesside except in a general way, and moreover the forecasts are only available to 1981, and for a simple breakdown of 'married' and 'non-married'.

8.27 In their local forecasts, the Ministry of Housing and Local Government assume that 1961 marriage rates apply at forecast dates. To be more precise, the Ministry assumed that for example the ratio between married males and females aged 15–39 years, and the total population aged 15–44 years in 1961 remains constant at future dates.

8.28 Marital status forecasts for Teesside have been made basically by applying the local five-year age-specific marriage rates of 1961 to the forecast population for future dates, and aggregating the results into the large age–sex–marital groups used in the household forecasts. The 1961 marriage rates are given in table 8.4 and the marital status forecasts are summarised in table 8.5.

8.29 Two small modifications have been made to the simple application of 1961 rates:

a marriage rates for the youngest age groups (15–29) were slightly raised in line with national forecasts, using the Government Actuary's 1964 England and Wales marital status forecast for guidance. This was done for consistency with the assumption about marital status underlying the selected forecast of population change by natural increase. Implicitly, this allowed for a rise in marriage rates at younger ages;

Table 8.4. Marriage rates, Teesside Population Area, 1961: (a) males

age group	total	married	*per cent*	single	*per cent*	widowed, divorced	*per cent*	single, widowed, divorced	*per cent*
0–4	22,888	–	–	22,888	*100.0*	–	–	22,888	*100.0*
5–9	19,709	–	–	19,709	*100.0*	–	–	19,709	*100.0*
10–14	20,930	–	–	20,930	*100.0*	–	–	20,930	*100.0*
15–19	15,766	158	*1.0*	15,608	*99.0*	–	–	15,608	*99.0*
20–24	13,360	4,711	*35.3*	8,638	*64.7*	11	–	8,649	*64.7*
25–29	14,832	10,878	*73.3*	3,896	*26.3*	58	*0.4*	3,954	*26.7*
30–34	16,203	13,285	*82.0*	2,779	*17.1*	138	*0.9*	2,917	*18.0*
35–39	16,770	14,357	*85.6*	2,183	*13.0*	230	*1.4*	2,413	*14.4*
40–44	14,968	12,980	*86.7*	1,703	*11.4*	283	*1.9*	1,988	*13.3*
45–49	14,140	12,346	*87.3*	1,397	*9.9*	397	*2.8*	1,794	*12.7*
50–54	13,580	11,812	*87.0*	1,240	*9.1*	528	*3.9*	1,768	*13.0*
55–59	12,030	10,251	*85.5*	1,073	*8.9*	706	*5.6*	1,779	*14.5*
60–64	9,327	7,747	*83.1*	767	*8.2*	813	*8.7*	1,580	*16.9*
65–69	6,420	5,083	*79.2*	468	*7.3*	869	*13.5*	1,337	*20.8*
70–74	4,527	3,131	*69.1*	360	*8.0*	1,038	*22.9*	1,398	*30.9*
75–79	2,820	1,598	*57.2*	252	*8.9*	970	*33.9*	1,222	*42.8*
80–84	1,500	642	*42.9*	136	*9.1*	722	*48.0*	858	*57.1*
85 and over	573	174	*30.4*	52	*9.1*	347	*60.5*	399	*69.6*
TOTAL	220,341	109,154		104,079		7,108		111,187	

Source: Census of Population, 1961, *County Volumes*.

Table 8.4. Marriage rates, Teesside Population Area, 1961: (b) females

age group	total	married	*per cent*	single	*per cent*	widowed, divorced	*per cent*	single, widowed, divorced	*per cent*
0–4	21,617	–	–	21,617	*100.0*	–	–	21,617	*100.0*
5–9	19,183	–	–	19,183	*100.0*	–	–	19,183	*100.0*
10–14	19,622	–	–	19,622	*100.0*	–	–	19,622	*100.0*
15–19	15,246	1,058	*6.9*	14,187	*93.1*	1	–	14,188	*93.1*
20–24	14,068	8,857	*63.0*	5,186	*36.9*	25	*0.1*	5,211	*37.0*
25–29	14,156	12,540	*88.6*	1,497	*10.6*	118	*0.8*	1,616	*11.4*
30–34	15,144	13,710	*90.5*	1,199	*7.9*	235	*1.6*	1,434	*9.5*
35–39	16,140	14,627	*90.6*	1,073	*6.6*	440	*2.8*	1,513	*9.4*
40–44	14,256	12,737	*89.3*	940	*6.6*	579	*4.1*	1,519	*10.7*
45–49	13,730	11,744	*85.5*	1,048	*7.6*	940	*6.9*	1,988	*14.5*
50–54	13,206	10,585	*80.2*	1,150	*8.7*	1,471	*11.1*	2,621	*19.8*
55–59	12,220	8,765	*72.2*	1,184	*9.8*	2,271	*18.0*	3,455	*27.8*
60–64	10,627	6,622	*62.3*	997	*9.4*	3,008	*28.3*	4,005	*37.7*
65–69	8,680	4,167	*48.0*	889	*10.2*	3,624	*41.8*	4,513	*52.0*
70–74	6,819	2,354	*34.5*	741	*10.9*	3,724	*54.6*	4,465	*65.5*
75–79	4,703	1,113	*23.7*	471	*10.0*	3,119	*66.3*	3,590	*76.3*
80–84	2,556	379	*14.8*	301	*11.8*	1,876	*73.4*	2,177	*85.2*
85 and over	1,170	73	*6.2*	130	*11.1*	967	*82.7*	1,097	*93.8*
TOTAL	223,122	109,321		91,402		22,399		113,801	

b a check was made that the total number of married males and married females at each forecast date was in reasonable agreement. For some forecast dates there was a small surplus of 'married' males, mainly a consequence of the surplus of males in the migration forecast. In the calculations, these surplus males were assumed to be non-married; they comprise a tiny fraction of the total population.

Table 8.5. Forecast of marital status, Teesside, 1971–91

age–sex–marital status group	1971	1978	1981	1991
married, male and female;				
15–39	102,199	114,798	131,961	155,483
40–59	102,131	102,840	103,104	115,836
60 and over	40,996	43,726	46,478	53,004
total	244,328	261,166	281,543	324,303
male and female, 20–39				
single, widowed, divorced	35,821	37,726	41,846	49,011
male, 40–59				
single	6,054	8,851	6,621	8,172
widowed, divorced	2,138	2,349	2,339	2,886
male, 60 and over				
single	2,473	2,813	3,107	3,847
widowed, divorced	5,769	6,564	7,250	8,977
female, 40–59				
single	4,681	5,162	5,322	5,686
widowed, divorced	5,699	6,283	6,478	8,921
female, 60 and over				
single	4,321	4,672	5,013	8,727
widowed, divorced	19,955	21,573	23,149	26,446

Forecast of households formed by married population

8.30 It was assumed that the number of households of married persons equalled half the total number of married persons from the marital status forecasts (see table 8.6). This was converted into a need for dwellings by assuming that each household would require one dwelling. There is evidence nationally of a rapid increase recently in the number of 'two-dwellings' families whose permanent home is in a town but who also have a seaside or country cottage. No allowance was made for such second dwellings as it seems likely that most weekend cottages owned by Teessiders would be located outside the Survey Area, for instance in the Lake District.

Table 8.6. Forecast of households formed by married persons, Teesside

1971	122,160
1976	130,580
1981	140,770
1991	162,150

Forecast of households formed by non-married population

8.31 This problem is highly complex but fortunately concerns only about a quarter of the likely total number of households.

a It is very likely that there will be in future a rise in the demand for housing from non-married persons. For example forecast rises in real incomes, and education standards seem likely to have this effect. The process of household fission has been proceeding for some time. Headship rates, for older age groups, and for widowed or divorced persons, were very high in 1951, and little further increase seems likely, but rates for the youngest age groups and, particularly, single persons may well rise rapidly. It is known that most of the 1951–61 drift of headship rates nationally was due to the rise in the rates for single persons in the younger age groups. The 1951 headship rate for persons under 40 years was very low and may well rise rapidly. The problem is, if single young persons break away from parent households, will they group themselves into two's, or three's or singly?

b It is likely that a major constraint on the rise of single persons' headship rates in the past has been the restricted supply of suitable accommodation. This factor may well operate in the future, and Government policy could limit the formation of small households of young single persons by restricting the building of small dwellings and favouring that of 'family' dwellings. This would have the effect of causing older married couples to remain in a family house after their children had grown up, when a small dwelling might have been better suited to their needs. This suggests that past trends in headship rates reflect supply as well as demand pressures, and this makes their use in forecasting more complicated.

8.32 The forecast was made as follows:

a Teesside headship rates for 1951 were calculated, using the 1961 definition of a family. The relevant statistics (see table 8.7) were supplied by the Ministry of Housing and Local Government. These rates were then applied to Teesside age–sex–marital status data for 1961, giving an estimate of the number of non-married households in 1961 according to the 1951 headship rates.

b An alternative estimate of non-married households was made using 1961 Census data. The total number of households on Teesside in 1961 was derived from the Household Composition Tables: it comprised 'total families' plus 'total households not containing a family'. The total number of married persons' households was estimated by saying that it comprised half of the enumerated total of married persons. The number of non-married households was therefore the difference between total households and married households. The estimate of married households may be subject to error, as it combines data from the full Census and from the 10 per cent Sample, and for the reasons noted in paragraph 8.20. But at 1951 the total number of married persons' households equalled exactly half of the enumerated total of married persons, and evidence in the next sub-paragraph suggests it is reasonable.

c A comparison between the two estimates of non-married persons' households therefore indicated the size of the drift between 1951 and 1961 (table 8.8). This drift was 2.8 per cent compared with an England and Wales rate of approximately 5 per cent. The difference between these two rates of drift for non-married persons ties in with the similar ratio for all headship rates: Teesside 0.8 per cent, England and Wales 1.3 per cent.

d Assumptions were then made about future drift, which is likely to continue but at a slowly declining rate. The only data on which to base assumptions are the 1951–61 drift for Teesside and for England and Wales, and data from the Home Interview Survey which gives an estimate of the total number of households of non-married persons at 1966. This is of course an inadequate basis for important assumptions. Therefore two alternative drift factors were used and a third set of forecasts was made using unchanged 1951 rates, to measure the effect of the assumptions. The assumed drift factors are given in table 8.9. The low assumption is an approximate extrapolation of the Teesside 1951–61 drift of 2.8 per cent. The high assumption takes account of the fact that Teesside

Table 8.7. Headship rates for non-married persons, Teesside Population Area, 1951

age–sex–mental status group (a)	enumerated households (b)	1-person households (c)	potential households 1951 (d)	potential households 1951 revised (e)	total households (f)	total population (g)	headship rate (per cent) (h)
male and female, 20–39:							
single, widowed, divorced	1,620	76	759	694	2,238	34,736	6.51
male, 40–59:							
single	1,130	45	15	–	1,085	4,711	23.03
widowed, divorced	1,312	22	6	–	1,290	1,833	70.39
male, 60 and over,							
single	686	32	7	–	654	2,175	30.07
widowed, divorced	3,159	94	17	–	3,065	5,045	60.75
female, 40–59:							
single	1,370	122	32	–	1,248	5,363	23.27
widowed, divorced	4,474	80	20	–	4,394	4,951	88.75
female, 60 and over							
single	1,533	139	22	–	1,394	3,746	37.21
widowed, divorced	9,423	398	58	–	9,025	12,646	71.37
TOTAL	24,707	1,008	934	694	24,393	75,209	–

Source: Statistics Branch, Ministry of Housing and Local Government.

Notes: column (a), age–sex–mental status group of head of household;
column (b), Census definition of enumerated households;
column (c), 75 per cent of all enumerated 1-person households which share with another household;
column (d), potential households, 1951 definition;
column (e), potential households, revised 1961 definition;
column (f), total households = col. (b) − col. (c) + col. (e);
column (g), total population in age–sex–mental status group;
column (h), 1951 based headship rate = $\frac{\text{col. (f)}}{\text{col. (g)}} \times 100$.

Table 8.8. Calculation of drift factor for non-married households, Teesside Population Area, 1951–61

age–sex–mental status group (a)	headship rate (per cent) (b)	total population 1961 (c)	estimated households, 1961 (d)
male and female, 20–39			
single, widowed, divorced	6.51	27,706	1,804
male, 40–59			
single	23.03	5,413	1,247
widowed, divorced	70.36	1,914	1,347
male, 60 and over			
single	30.07	2,035	612
widowed, divorced	60.75	4,757	2,890
female, 40–59			
single	23.27	4,330	1,008
widowed, divorced	88.75	5,261	4,669
female, 60 and over			
single	37.21	3,529	1,313
widowed, divorced	71.37	16,318	11,646
TOTAL	–	71,263	26,536

calculation of drift factor, 1951–61, for non-married households:

(e) total households, 1961 = 27,270

(f) ∴ drift factor = $100 - \frac{26{,}536}{27{,}270} \times 100 = 2.8$ per cent

Source: Census of Population, 1961, *Household Composition Volume* and *County Volumes*.

Notes: column (a), age–sex–mental status of head of household,
column (b), 1951 headship rate, from table 8.7;
column (c), total population 1961, from Census of Population;
column (d), estimated households, 1961 = col. (b) × col. (c);
line (e), total households, from Census of Population;
line (f), drift factor = $100 - \frac{\text{col. (d)}}{\text{line (e)}} \times 100$.

Table 8.9. Drift factors for non-married households (per cent)

	1971	1976	1981	1991
low assumption	5.8	6.5	8.5	10.0
high assumption	12.0	14.0	18.0	20.0

Table 8.10. Forecast of households formed by non-married persons, Teesside, 1971-1991

	high assumption	low assumption	1951 headship rates
1971	34,610	32,600	30,900
1976	36,720	36,170	33,950
1981	43,250	39,400	36,650
1991	50,620	46,400	42,190

drift between 1951 and 1961 was lower than that for England and Wales, and also of the evidence of the Home Interview Survey which indicates that household formation by non-married persons probably has been rapid between 1961–66, leading to a much higher rate of drift.

8.32 The forecasts of the number of non-married households were then calculated by applying the 1951 headship rates to the forecasts of population in the relevant age–sex–mental status group from table 8.5; and the consequent estimate of the total number of households was adjusted by the drift factors according to the high and low assumptions.

8.33 The final forecast of the number of non-married households is given in table 8.10. It will be noted that although the range of assumptions about future drift is not large proportionately the effect is quite significant in absolute terms by 1991. These forecasts should therefore be reviewed when data becomes available from the 1966 Census.

The forecast of total households

8.34 The final forecast of the total number of households on Teesside, based on the 1961 data, is given in table 8.11. The estimated number of migrant households is based on the assumed rate of net inward migration and is necessarily crude. Nonetheless it is clear that the effects of the assumptions about migration are much more serious than the effects of assumptions about drift factors in headship rates. The effects of migration are still more strongly emphasised by considering quinquennial changes in the numbers of households in Teesside (see table 8.12).

Table 8.11 Forecast of total households, Teesside, 1951–91

	total population (including migration)		migrant population
	low assumption	high assumption	
1951	121,420	121,420	–
1961	138,960	136,960	–
1966	146,860	147,360	940
1971	154,770	166,780	2,630
1976	166,760	189,300	8,160
1981	180,170	184,020	9,970
1986	193,880	197,980	13,630
1991	208,560	212,770	17,780

Table 8.12. Net increases in the numbers of households, Teesside, 1961–91

	native population	migrant population	total population
1961–66	7,460	940	8,400
1966–71	7,730	1,690	9,420
1971–76	8,960	3,560	12,530
1976–81	10,920	3,790	14,720
1981–86	10,200	3,680	13,860
1986–91	10,740	4,160	14,890

Note: high assumption about drift factors.

8.36 Finally, the comparatively slight effect of the alternative assumptions about rates of natural increase made in chapter 1 should be noted, assuming the same level of inward migration. The highest assumed rate of natural increase (forecast AX) would produce 214,360 households on the high assumption about drift factors; and the lowest rate of natural increase (forecast CY) would give 211,780 households. This is a negligible difference even compared with the assumptions about drift factors.

Forecast of household sizes

8.38 The purpose of making the forecasts of total households is to have estimates of the number of dwellings required at forecast dates. In addition it is of value to know the broad range of sizes of dwellings required, so that housing construction programmes can be defined in more detail. For this purpose it is valuable to have indications of the likely range of household sizes at forecast dates, that is the number of one-person, two-person, etc., households.

8.37 It is not possible to make detailed forecasts of households in terms of sizes, but broad estimates can be made after an analysis of past data on household sizes. A significant problem is that no past data exist on the range of household sizes in terms of the potential households defined in the forecasts. The only data available is in terms of the enumerated households of the Census county volumes. The relationship between enumerated and potential households is shown in table 8.13. The comparison illustrates one facet of the process of household fission, that an increasing proportion of family nucleus households are finding it possible to acquire a home of their own, and therefore the excess number of potential households is being reduced.

Table 8.13. Enumerated and potential households, Teesside Population Area, 1951–61

	enumerated households	potential households
1951	109,858	119,271
1961	132,686	136,507

8.38 In the analysis of the range of household sizes, one approach was to look at the likely age and marital status of the households in the forecasts. Table 8.14 shows a clear relationship between the age and marital status of the head of household and the average size of their households.

Table 8.14. Average size of household, County Durham, 1951

status of head of household	persons per household per cent
single, widowed or divorced	
20–39 years	2.9
40–59 years	2.7
60 years and over	2.2
all households	2.4
married	
16–39 years	3.7
40–59 years	3.9
60 years and over	3.0
all households	3.7

Source: Census of Population, 1951, *County Volume*

8.39 It is likely that this pattern applied on Teesside and that the same relationships will apply in the future. The forecast of future numbers of households for Teesside shows that the proportion of non-married households is expected to rise gradually in the future, as is the proportion of married households with heads aged over 60. It is likely then an increasing proportion of the non-married households will be in the younger age groups. The proportion of married households in the youngest age group is also expected to rise slightly, while the proportion of married households in the middle age group is likely to fall quite considerably. The trend therefore is for an increasing proportion of small households (see table 8.15).

Table 8.15. Marital status of heads of household, Teesside, 1961–91 (per cent)

head of household		1961	1971	1981	1991
single, widowed or divorced		20	22	23	24
married,	15–39 years	32	30	33	33
	40–59 years	35	34	30	28
	60 years and over	13	14	14	15
TOTAL		100	100	100	100

Note: the values in this table were estimated as follows:
1961 single, widowed or divorced households, estimated as in paragraph 8.32(b);
1961 married households; the heads of household in each age group were assumed to be the same as the number of married males in each age group, from the 1961 Census;
1971–1991 single, widowed or divorced households; obtained from forecasts of non-married households;
1971–1991 married households; the heads of household in each age group were assumed to be the same as the number of married males in each age group, obtained from the marital status forecasts.

8.40 A second method of analysis of household sizes was based on past trends in the proportion of households of different sizes (see table 8.16). There has been a rapid rise throughout the period in the percentage of small households of one and two persons, the percentage of three- and four-person households has been relatively stable, and the percentage of large households has fallen very rapidly. At 1921 only 36 per cent of total households were of three persons or less; by 1961 the figure was 59 per cent, a remarkable change in a relatively short period. This pattern reflects a general fall in fertility rates and the size of completed families through most of the period, and rising prosperity and changing social patterns which have resulted in the fission of large households partly by hidden family nuclei being able to acquire a home of their own and partly by a greater proportion of non-married persons making their own homes. The process however has been slower on Teesside and is less far advanced than in England and Wales.

Table 8.16. Distribution of household sizes, 1921–61 (per cent)

persons per household	1	2	3	4	5	6	7 and over
England and Wales							
1921	6	17	21	19	14	10	13
1931	7	22	24	20	12	7	8
1951	11	28	25	19	10	4	3
1961	12	30	23	18	9	4	3
Teesside							
1921	3	14	19	18	16	11	18
1931	4	17	23	21	15	9	11
1951	8	23	24	21	12	6	6
1961	11	26	22	20	11	5	5

Source: Census of Population, 1921–61.
Note: refers to enumerated households

8.41 It seems very likely that these well-marked trends will continue in the future. The final Teesside population forecast used for planning purposes implies that Teesside fertility rates will be relatively constant in future, with perhaps a slight downward trend in completed family size. At the same time the household forecasts assume a rise in the proportion of households of single, widowed and divorced persons, whose average household sizes are likely to be small. It is likely therefore that the proportion of small households will continue to rise, and the proportion of large households to fall.

8.42 It is not possible to make an accurate prediction of the size distribution in 1991 by simple extrapolation of these trends as they refer to enumerated households while the forecast refers to potential households. Nonetheless it is possible to make a reasonable prediction of the likely situation in 1991 (see table 8.17).

Table 8.17. Size of households, Teesside, 1966–91 (per cent)

	1966	1991
1–3 persons	59	66
4–5 persons	31	27
6 and over persons	10	7

Note: refers to potential households.

8.43 There are a number of possibilities which might upset this forecast. The first is that the Teesside final population forecast may be based on wrong assumptions and that Teesside fertility rates will continue to rise. This does not seem likely however, for reasons given in chapter 1. Another uncertainty involves the migrant component of the forecast population. This is likely to be composed mainly of young persons, with families, and it could be that they might raise the percentage of large households. However, the migrant element in the final population forecast comprises less than 20,000 households out of a total forecast of 213,000 households at 1991 and a proportion of these would be small households. There would not be sufficient large households to counterbalance the falling proportion of large households in the native population. In any case the migrant element is an uncertain quantity in the population forecast.

8.44 The conclusion therefore is that there is likely to be an increase in the proportion of small households in future of the order shown in table 8.18. The implications of this forecast for the construction of new dwellings is examined in chapter 10.

Table 8.18. Number of households, by size, Teesside, 1966–91

	1966	1991	1966–91
1–3 persons	66,700	140,400	+63,700
4–5 persons	45,600	57,500	+11,900
6 and over persons	14,700	14,900	+ 200
TOTAL	147,000	212,800	+65 800

9 Survey of housing and environmental deficiency

The Housing problem

9.1 The Land Use Survey of the Teesside Survey Area shows that it contained 144,900 separate dwellings in the winter of 1965–66, including dwellings in blocks of flats, detached, semi-detached, and terrace houses. The age of these dwellings is approximately as shown in table 9.1. In recent years, this housing stock has been changing by the construction of between 3,000 and 4,000 new dwellings a year, and the demolition of a rapidly increasing number of slum dwellings each year, which, in 1966, was in excess of 1,200 dwellings cleared.

Table 9.1. Date of construction of dwellings, Teesside, 1966 (number of dwellings)

pre–1895	23,000
1895–1914	35,000
1918–1939	30,000
post–1945	56,000

Source: Land Use Survey.

9.2 Various estimates have been made of the degree to which this housing stock can be regarded as providing reasonable shelter. A recent estimate was made by the North East Consortium of Local Authorities, using two alternative methods of assessment of the likely number of sub-standard dwellings in Billingham, Stockton, Thornaby, Middlesbrough, Eston and Redcar. The first identified areas of dwellings built prior to 1914 at a net density greater than 90 habitable rooms per acre. It showed roughly 37,000 dwellings as falling below this standard in the urban core of Teesside. The second measure used a very crude index of environmental deficiency, including the absence of basic facilities such as a bathroom. This measure identified about 34,000 dwellings that should be cleared by an arbitrary date, 1981, thus broadly confirming the findings of the first measure.

9.3 But this approach is concerned with the ability of the individual dwelling to afford a reasonable standard of shelter. In this, it follows the long established tradition of the Public Health and Housing Acts which have always measured fitness through factors such as state of repair; stability of the structure; freedom from damp; natural lighting and ventilation; water supply, drainage and sanitary convenience; and facilities for the storage, preparation and cooking of food, and for the disposal of waste water. To these may be added criteria laid down in bye-laws, such as the space and relationship between buildings.

9.4 Following this approach, detailed surveys are made by the public health departments of the local authorities of dwellings known to be of a low standard. From the results of the survey, a slum clearance programme is defined which balances the degree of fitness of dwellings against the likelihood of there being resources available for their clearance and replacement by new dwellings, in competition with the resources required for the construction of new dwellings.

9.5 If the estimates made by the North East Consortium are a reasonable indication of the scale of the slum clearance problem, then a very considerable acceleration will be required in current rates of clearance. The average annual rate would have to be about 2,300, if these possible slums were to be cleared by 1981.

9.6 In recent years, however, the simple approach whereby the only course of treatment for a slum dwelling was its clearance has been replaced by more sophisticated policies. Improvement grants offer a means of raising the standard of fitness of a dwelling, whether it be by installing a bathroom, or repairing certain kinds of structural defect. In this way, it is likely that some of the dwellings within the potential slum category could be saved. But the concept of treatment by rehabilitation of the dwelling is itself changing to a more sophisticated form. In the report *Our Older Homes, a Call for Action* (H.M.S.O., 1966), the importance of a number of specific environmental characteristics was stressed, with the comment that 'the satisfactory house in a satisfactory environment must be the aim, and the standards set for both must be achieved and then maintained'.

9.7 A special study was made of the possibilities of rehabilitation of *Deeplish, Rochdale* (H.M.S.O., 1966). This showed the range of environmental improvement which was technically possible. It included the improvement and conversion of suitable dwellings and the clearance of unfit dwellings; the provision of garages and car parks; paving and landscape treatment of open spaces; and changes to the circulation system, including the closure of certain roads.

9.8 The rehabilitation of residential areas can have two quite different aims which should not be confused. The first aim is the rehabilitation of an area which has high intrinsic quality but which has decayed because of the workings of the urban land market. Typical areas of this kind include Canonbury, in London, areas of Georgian and early Victorian houses and squares for which the demand is increasing, thus generating a rehabilitation process. This type of area does not exist on any but the smallest scale in urban Teesside.

9.9 The second aim is the matching of total housing activity to the resources that are available. The specification of standards is idle unless realistic means of achieving them can be specified. A vast rehousing programme could come at the wrong time. Added to the demand for new houses to accommodate new families, it could set up a total demand for men, materials and money which could not be met; and either prices would rise or some form of rationing or control would have to be introduced. In either case, the programme would not be achieved. Alternatively, the time could be wrong in the sense that demolished buildings could be improved in some way, and still provide several years of useful accommodation at a cost which would produce better value for money in the long run than would immediate demolition and rebuilding.

9.10 It is this second aim which is relevant to urban Teesside. As in Deeplish the areas are obsolescent because standards of design of dwellings and the provision of facilities in the environment have risen since the time of their construction. Ultimately, these areas will have to be cleared and redeveloped but this is likely to be long delayed because of the scale of the problem. The available resources will not permit redevelopment all at once, nor would this give the best value for money. But there is still need to offer the inhabitants of these houses an acceptable quality of environment until the proper action can be taken. For this reason, rehabilitation and rehousing have to be complementary weapons in the attack on sub-standard housing.

9.11 This chapter therefore contains an account of the following:

a a survey of the quality of housing and environment on Teesside;

b the division of Teesside into a series of smaller areas, for each of which proposals are given of

(i) the type of action that should be taken to remedy deficiencies in the standards of the dwelling and its environment under the general headings of clearance, possibly with redevelopment; rehabilitation; and no action required;

(ii) the amount of overspill likely to be the result of clearance and area rehabilitation;

(iii) the priority of action;

(iv) the scale of the likely cost of action.

9.12 Chapter 10 makes a comparison between the resources needed for rehabilitation and those needed for new dwellings for population growth, and will make proposals for the timing of the rehabilitation programme. And the implementation of rehabilitation policy for two areas, Parkfield, Stockton, and Southfield, Middlesbrough, was illustrated in chapter 12 of volume 1. In none of these three chapters is there a detailed discussion of the legislative and financial measures necessary for the implementation of this policy. It is enough, at this stage, to demonstrate the scale and nature of the problem and to outline the technical means for its solution.

Policy for redevelopment and rehabilitation

The survey and analysis: a brief description

9.13 The survey and analysis, through to the definition of a policy for rehabilitation, passes through six stages. At the end, a statement of policy is made for 174 separate areas of housing, most containing between 400 and 1,000 dwellings. The survey thus covers 90 per cent of the dwellings on Teesside, excluding only small groups of dwellings and villages which are not susceptible to this form of analysis.

9.14 It is important to understand that although continuous reference is made to the scale of redevelopment or rehabilitation in terms of the numbers of dwellings involved, and costs are expressed as an average cost per dwelling, the survey, analysis and policies actually refer to large groups of dwellings, taken as a whole. The basic evidence is derived from a random sample of dwellings whereby approximately one in fifteen of the dwellings on Teesside were visited for the purposes of the Home Interview Survey; other information was collected and coded in the Land Use Survey for those same specific dwellings.

9.15 The six stages of the process were as follows.

a Information was collected in the sample survey about the following characteristics:

the dwelling: condition; provision of bath, hot water, w.c.; house type; age; access; outdoor space; car parking provision.
its environment: privacy; noise; traffic, atmospheric pollution; landscape quality; density.
its location: access to public open space, shops, primary schools, and public transport.

b The survey material was analysed and a system devised for measuring the relative quality of different residential areas. This system, called the Survey of Housing and Environmental Deficiency (SHED), involves the use of penalty points. That is, dwellings in each area are allotted a score of penalty points if they are deficient in any of the characteristics listed above. The higher the average penalty score, the more deficient a residential area is likely to be, and the less satisfactory will it be as a place in which to live.

c An analysis of the SHED scores showed that, on average, deficiencies in the dwelling and its environment could be remedied by rehabilitation at an approximate cost of £39 per penalty point. However, analysis of a number of areas showed that only 66 per cent of the penalty points scored in an area were capable of remedial action by rehabilitation. The remainder could be remedied only by clearance and, in many cases, overspill to a new site.

d A comparative analysis of the benefits arising from the two alternative courses of remedial action was made. The first was for the complete clearance of the existing stock of dwellings in an area, and their replacement so as to provide an acceptable environment that would satisfy the requirements of the characteristics listed above. The alternative course would be the rehabilitation of an area. At its simplest, this might mean no more than suitable landscape treatment. And at its most expensive, it might prove necessary to demolish a proportion of the dwellings in an area, so as to provide open space, parking provision, arrangements for circulation; and to provide bathrooms, and renovate the remaining dwellings. It was found that in areas where the average SHED score was greater than 38 penalty points, demolition and replacement would in the long run be cheaper than rehabilitation. In arriving at this comparison, due allowance was made for the cost of replacing cleared dwellings on new sites, where overspill was necessary as part either of the programme of redevelopment, or that of rehabilitation. Due allowance was made, too, for the shorter life that could be expected of dwellings in a rehabilitation area, and the lower standard of environment that could probably be achieved by rehabilitation compared with that in a redevelopment area.

e Teesside was then divided into a series of environmental areas, based upon social groupings and the provision of primary schools and shops, with the aim of excluding through traffic. Each of these environmental areas was further subdivided into smaller areas, groups of dwellings of a roughly homogeneous character, for which remedial action would be prescribed. A set of ceiling densities was defined for each environmental area as a tool in calculating the approximate overspill from each area. Finally, those residential areas which would see a change of use, as part of the urban structure policy, were identified.

f From the analysis and the policies set out for environmental areas, it was then possible to define for each of the 174 smaller areas, the principal type of treatment, whether clearance, or rehabilitation; the amount of overspill resulting from either policy; the approximate numbers of dwellings effected by clearance, redevelopment, rehabilitation or no action; the likely cost of the proposed action, and the priority for treatment.

Recommended policy

9.16 The results of the analysis and a summary statement of the policy for rehabilitation is shown in table 9.2, and on figures 9.6 and 9.7.

Priority group 1. These are areas where nearly all of the dwellings have a SHED score in excess of 38 penalty points and where therefore nearly all the dwellings should be cleared. Urgency is given to the treatment of this group by the poor structural quality of dwellings and the high incidence of atmospheric pollution. Many of these dwellings are already included in clearance orders. They are located near the central areas of Stockton and Middlesbrough, and at Thornaby, North Ormesby, Grangetown and South Bank. Competition from other land uses will probably mean that these areas would not be redeveloped for residential uses.

Priority group 2a. These areas have an average SHED score of less than 38 points. That is, the environment as a whole is better than for group 1, but nevertheless, the dwellings either have a poor structural quality or the area suffers from overcrowding, or it suffers from atmospheric pollution. For these reasons, treatment is relatively urgent, and will take the form of intensive area rehabilitation in the course of which many dwellings would have to be demolished. These areas are widely scattered through Teesside.

Priority group 2b. They have the same degree of urgency as group 2a, but for different reasons. The average SHED score is greater than 38 points, thus their environment is as bad as those in group 1. But they do not suffer from bad structural condition, or intensive atmospheric pollution and therefore there is less urgency for treatment than for group 1. They are located in the older parts of Stockton, Middlesbrough, Thornaby and Eston. Treatment is likely to involve intensive rehabilitation and redevelopment.

Priority group 3. In general, these are the areas of houses built before 1914, remaining after the first two priority groups have been treated though they do include some areas of more recent development. The SHED scores lie between 12 and 38 points. They include much of Stockton and Middlesbrough, Redcar and the older parts of East Cleveland. This is the heart of the rehabilitation problem. Most of the dwellings are structurally sound but their environment is unlikely to satisfy living standards for the next thirty years. In these areas treatment would be in the form of rehabilitation of dwellings and their environment, in the course of which, more than a quarter of the dwellings might have to be cleared to provide reasonable space standards and provision of facilities.

Priority group 4. These are areas of dwellings built since 1945 and in the latter part of the 1930's. Nominally, these areas may require rehabilitation to remedy deficiencies in their environmental quality. This is a misleading account, however, of the real problem. In most of these areas, their date of construction is too recent for the landscape to have matured, or for shops, schools and open spaces to have been provided. By the time that the real deficiencies in the first three groups have been remedied, many of the apparent defects in group 4 will have corrected themselves. Therefore, it may be reasonable to exclude this group when considering the scale of the rehabilitation problem. The SHED scores in this group are mainly between 10 and 20 penalty points.

Others. These are isolated dwellings, small villages and other areas that were not covered by the analysis, mainly because of their unsuitability for inclusion in what is essentially an urban analysis of housing. It includes, too, areas where no action is required.

9.17 The full method is described in the rest of this chapter and the full list of policy recommendations is given in table 9.10. Too much should not be read into this analysis or the proposals, or above all, the cost of action. The whole analysis is a broad tool designed to give a rational basis for action, particularly for the sequence of priority and the likely demand on resources. The real cost of treatment for any area will be established only after a design has been prepared for the treatment of that specific area.

Method of survey and analysis

The survey

9.18 Several different methods of making a comparative assessment of housing and environmental quality have been developed by different organisations. As part of an

Table 9.2. Summary of policy for redevelopment and rehabilitation, Teesside

priority group	numbers of dwellings					estimated cost of action (£'000's 1986 prices)
	total (a)	clearance (b)	rehabilitation (c)	no action (d)	overspill (e)	(f)
1	11,250	10,490	760	0	8 690	31,977
2a	7,810	2,870	4,710	230	2,740	11,890
2b	4,660	3,090	1,590	0	1,820	10,784
3	37,940	10,260	22,690	4,990	8,990	46,204
4	68,800	1,040	42,030	25,730	950	28,648
others	14,420	–	–	14,420	–	–
TOTAL	144,900	27,760	71,780	45,370	23,190	129,503

Notes: col. (a), Total number of dwellings at December 1985;
col. (b), includes dwellings cleared as part of the process of comprehensive clearances for redevelopment as part of area rehabilitation, and for change of use;
col. (c) includes dwellings which will remain and which will require some rehabilition;
col. (d) includes groups of dwellings in areas where some action may be necessary but not for those particular dwellings;
col. (e) includes dwellings for whose replacement space would not be available in the original area and for which new sites will have to be found;
col. (f) includes the costs of the clearance, redevelopment, rehabilitation and overspill of dwellings; and the costs of the provision of services, landscaping, open spaces, local shops and primary schools. It includes an allowance for infilling of 2,160 dwellings.

assessment at a regional scale, reliance could be placed on very general statistics, such as the age of dwellings, density and the provision of facilities such as a bathroom. This method has the advantage of using data that are readily available for different regions. But it would be too generalised a tool for assessing the housing quality of a single urban subregion.

9.19 The special study of Deeplish, in Rochdale, made by the Ministry of Housing and Local Government, tackled the problem from the other end. Professional staff were used to survey and assess the area in a considerable degree of detail. In the end, when a detailed design is to be prepared for the implementation of a rehabilitation programme for a small area such as Deeplish, professional staff will have to be used. But this is a very different task from that of making a comparative assessment of housing in an area as large as Teesside.

9.20 A third method of approach was indicated by the American Public Health Association in its *'Appraisal Method of Measuring the Quality of Housing'* (New York, 1945), and also developed for a study of urban decay in Manchester, conducted on behalf of the Civic Trust for the North West. The essence of the method lies in two ideas. First, to enable the survey to be made during a limited period of time by a large staff of field workers, a detailed check list was prepared of the characteristics to be examined. Second, to permit a comparative evaluation to be made which would be a synthesis of all the items in the check list, a system of penalty points was adopted. That is, if a particular characteristic in the check list was missing or in any way deficient, then a specified number of penalty points was allotted to that dwelling. At the end, the total number of penalty points for each dwelling was added together and the average score calculated for each zone so that the worst zone with the greatest number of deficiencies, was that with the highest average number of penalty points.

9.21 The method of looking for particular deficiencies and allotting penalty points was adopted for Teesside. The idea was modified, however, by the use of a sample survey for the collection of data. The sample was that used for the Home Interview Survey, in which approximately 11,000 dwellings were visited, one in fifteen of the total. These dwellings were scattered randomly throughout Teesside, and could thus represent a form of geographical sample. In the Land Use Survey, data were collected and organised in a system of about 65,000 geographical zones. To enable data from the two surveys to be used with precision, each dwelling visited in the Home Interview Survey was identified in the Land Use Survey as a specific geographical zone with its own full set of data. Thus, data could be made available from both surveys for a set of 11,000 sub-zones, each of which represented a single dwelling.

9.22 Data from the two surveys were further organised into a set of 350 basic zones, each of which was identified by an unique, four-digit reference number. These basic zones were a compromise between the requirements of land use and transportation planning, modified by the boundaries of enumeration districts in the Census of Population, 1961. The full extent of these surveys, the method of collecting, storing and recovering data is described in chapter 25.

9.23 The following information was taken from these two sources of data:

Home Interview Survey Basic Facilities
    fixed bath
    hot-water system
    internal w.c.

Land Use Survey (by field survey)
    the dwelling
        condition
        means of access
        outdoor private space
        parking or garage provision
        privacy
        noise
        traffic
        visual landscape
        landscape quality
        atmospheric pollution

Land Use Survey (by cartographic analysis)
    access to facilities
        public open space
        shops
        primary school
        public transport
    density
    age of dwelling

9.24 The Land Use Survey was carried out by temporary staff under the supervision of professional planning staff. This was possible as the aim of the surveys was to get a wide range of information at a generalised level about the whole of Teesside, rather than to get detailed information about particular features or areas. Considerable care was taken to ensure that the temporary staff were trained in observation, and that a consistent basis of comparison was used in assessing, say, noise levels.

9.25 The system of penalty points that was used in the synthesis is given in Appendix 1 to this chapter. The actual values were arrived at after a process of trial and error which, for selected basic zones, appeared to give a reasonable comparative assessment of their quality. As will be shown later, the values used in the system have a considerable degree of validity.

9.26 The work of calculation was carried out by computer, the program being devised to give the following data for each of the 350 basic zones on Teesside:

a the number of dwellings and the average score per dwelling in category A, 0–11 penalty points;

b the number of dwellings and the average score per dwelling in category B, 12–37 penalty points;

c the number of dwellings and the average score per dwelling in category C, 38–99 penalty points;

d the number of dwellings and the average score per dwelling in category D, 100 penalty points;

e the average number of penalty points per dwelling for the entire zone.

The significance of the particular categories selected will be explained later in this chapter. At first, it had been thought that four categories of dwelling would be needed. In the event, only three categories proved necessary, and category D, dwellings with 100 penalty points, is an arbitrary one which never occurs. As the output referred to the sample data, expansion factors were used for each basic zone, to give the actual number of dwellings in each category.

Cost of remedial action

9.27 It is important to realise that in this type of assessment each individual characteristic is relatively unimportant. The true measure of quality in an environment arises from the complex interaction of many features. If, for instance, high density alone was an undesirable feature of residential environments, many of the most noteworthy examples of postwar redevelopment would be condemned equally with areas of terrace dwellings built prior to 1875, where the densities may be in excess of fifty dwellings per acre. But the postwar redevelopment schemes move into a different category from the nineteenth century terrace dwellings because of the lack of open space, the poor condition, the age and many other characteristics of the areas of older terrace dwellings.

9.28 When it comes to the question of remedial action, it must be realised, too, that some features of a dwelling or its environment cannot be treated by rehabilitation; demolition and replacement at the higher standard is the only solution. The characteristics which cannot be treated by rehabilitation are shown in Appendix 1. Some are simple: the age of dwelling; the house type; the degree of privacy; and the means of access to the dwelling; the incidence on that site of atmospheric pollution; none of these can be changed by rehabilitation. Two other characteristics would be remedied only in part; these are density, in which clearance to reduce densities would be considered only in the more dense areas; and parking provision, where clearance to provide extra space would probably occur only to give a standard of one car space per dwelling unit. But, for every other characteristic, it would be theoretically possible to take remedial action by means of rehabilitation to the point at which that deficiency would be entirely removed.

9.29 The relationship between the number of remedial features and those which could not be remedied by rehabilitation was examined in greater detail for a number of basic zones. It was found that, irrespective of the actual features involved, there was a strong linear relationship between the number of remedial points and the average number of penalty points per dwelling in a basic zone. That is, independently of the total number of penalty points per dwelling allotted to a basic zone, about 65 per cent of those points could be remedied by rehabilitation, but the features that accounted for approximately 35 per cent of the points, could be remedied only by comprehensive redevelopment, in some cases, on a different site.

9.30 The next stage in the analysis is to consider the characteristics which could be remedied and to examine the possible costs of remedial action. Three different schemes were available for examination. The first were details of a set of improvements made to terrace houses in Stockton-on-Tees, published in the *Architects' Journal*, 11th March 1954. The second example was the Deeplish Study. And the third was a pilot study made by Teesside Survey & Plan of the Waterloo Road area, Middlesbrough. The number of penalty points according to the SHED system which would have been remedied by the particular form of rehabilitation was estimated, and the average cost per penalty point was calculated. Details are given in Appendix 2 and the results are summarised in Table 9.3.

Table 9.3. Average cost of remedial action (£ per penalty point)

Stockton,	1st improvement scheme, dwelling only	£36.0
	2nd improvement scheme, dwelling only	£42.5
	3rd improvement scheme, dwelling only	£44.5
Deeplish,	dwellings only	£44.0
	1st environmental rehabilitation scheme	£33.0
	2nd environmental rehabilitation scheme	£44.5
Waterloo Road, rehabilitation of dwellings and environment		£31.8
average cost of rehabilitation		£39.2

9.31 From this table, it seemed that the cost of rehabilitation was relatively constant when expressed as a unit cost per penalty point. This is the result one would expect if the system of penalty points has validity. The comparatively narrow range of values substantiates the accuracy of the pointing system, though a larger number of examples should be used if the system is to be tested rigorously. In the meanwhile, this narrow range offers justification for assuming that, on average, rehabilitation would cost about £39 per penalty point. But it must be remembered that on average, only 65 per cent of the penalty points in a zone are capable of being treated by rehabilitation.

Choice between rehabilitation and redevelopment

9.32 The rehabilitation of a residential area and its dwellings involves correcting the deficiencies revealed by the survey of housing and environment. The alternative course of action is to clear completely the dwellings and other facilities in the area, and create a new environment either on the original, cleared site or on an unoccupied site in a new location. The decision between these two courses of action should be made after the necessary calculations of costs and benefits of each course of action has been made.

9.33 The cost of each course of action must account for the full range of facilities to be provided. That is, it must include the cost of rehabilitation, or clearing and redeveloping the dwellings; the cost of providing all the features that enter the survey, including open space parking provision, primary schools, local shops, and the creation of a satisfactory residential environment. The estimate must cover the cost of the replacement of dwellings in a suitable environment in those cases where overspill is necessary.

9.34 The benefit accruing from each course is more difficult to measure precisely. There are two ways of proceeding. One is to consider whether it is cheaper, in the long run, to spend, say, £3,000 on a new house now, or to spend, say, £1,000 now on rehabilitation, sufficient to extend its life for, say, fifteen years, and then to spend whatever current costs may then be required on building a new house. This approach is advocated by L. Needleman in *The Economics of Housing*, but it contains many difficulties, including, in particular, uncertainty about future building costs, and the necessity of making various assumptions to which the answer appears to be very sensitive. This is not the place to make a detailed criticism of the approach. One which deals with it from a slightly different angle, appears in an article by B. E. M. Sigsworth and R. K. Wickinson, in *Urban Studies*, June 1967.

9.35 Another method is to consider the two different consequences of spending now two different sums of money. Although it may not be possible to value the consequences, it may be possible to compare them in a quantitative way. Thus a layman may have difficulty in valuing an orchard, but he may easily be able to say that one orchard is worth twice as much as another orchard. If he is then told that the better orchard costs £20,000 whereas the other one costs £8,000, then he considers that the better one is twice as good, but costs more than twice as much as the other. In such a case he would get better value for money by buying the less good orchard, provided that he could put the remaining money to good use. This approach has been used in the present exercise by comparing the ratio of two costs, the cost of a new house and the cost of rehabilitating, with the ratio of the present worths of the two actions. A new house gives shelter of a specified standard over its life-time. Rehabilitating a house gives shelter of a lesser standard over a shorter period. Without saying how much each of these worth, a reasoned statement can be made about the ratio of their worths. In doing so the idea of 'present worth' is used as follows. If,

$$\frac{\textit{cost of rehabilitation}}{\textit{cost of redevelopment}} > \frac{\textit{Present worth of rehabilitation}}{\textit{present worth of redevelopment}}$$

then the better value for money comes through redevelopment. In the opposite case it is cheaper to rehabilitate. This inequality can also be written as below. If this holds then redevelopment is cheaper:

$$\text{i.e. if } \frac{\textit{cost of rehabilitation}}{\textit{present worth of rehabilitation}} > \frac{\textit{cost of redevelopment}}{\textit{present worth of redevelopment}}$$

9.36 The meaning of 'present worth' can be demonstrated by the following example. Most people would be unwilling to pay £500 now for the promise of a car in a year's time if they could get an equally good car now for the same sum of money. The sum of money which they would be prepared to pay now for this promise would be its *present worth*. It would depend on many factors, including the degrees of trust they have in the firm making the promise, and the rate of interest they could get if they put their money into the bank. For a promise of a car in ten years time they would pay even less. In general, the present worth of something diminishes as the period to wait for it gets longer. In calculating the present worth it is necessary to make various assumptions about some of these factors, but to some extent the errors which may exist in these assumptions may, under certain circumstances, tend to cancel out. It is important to keep in mind that any calculation of present worth is an approximation, albeit one which is often very useful and informative.

9.37 It is shown in Appendix 3 that the replacement of a demolished dwelling in a new environment that is the result of redevelopment will provide an adequate standard of shelter and amenity at a cost of about £3,030 per dwelling. This figure includes the provision of services, local shops, primary schools and a full landscape treatment. Dwellings built in this way in 1966 would be constructed to the standards laid down in the Parker–Morris report and, on the precedent of the last twenty years, it is probable that standards will continue to rise in the future.

9.38 However, it is now reasonable to compare this cost with the cost of rehabilitation, as the end-product of rehabilitation could rarely equal that gained by a process of redevelopment for two reasons. First, a dwelling provided in replacement of a demolished dwelling is likely to provide a higher standard of living than a rehabilitated dwelling because it will be designed to contemporary standards, whereas the rehabilitated dwelling is still likely to have some characteristics to a lower standard. When comparing the two alternatives, therefore, the cost of rehabilitation was compared with only 80 per cent of the cost of redevelopment (i.e. £2,425 per dwelling) if the standards of environment are to be comparable. This is an arbitrary, but reasonable, percentage; it will be later explained why the exact percentage does not matter for this purpose.

9.39 This figure of £2,425, however, needs further qualification. It has been shown that only some of the deficiencies in a dwelling or its environment are capable of being corrected by rehabilitation, equal to 65 per cent of the total penalty points scored by that dwelling. Thus if the possibility of improvement by rehabilitation is to be compared with that by redevelopment, only 65 per cent of the cost of the lower standard of redevelopment (i.e. £1,575 per dwelling) should be compared with the total cost of the improvements that can be made by rehabilitation.

9.40 That is, when assessing the desirability of a policy of rehabilitation of the kind that is likely to be required on Teesside, it must be recognised that the environment thus created is likely to be of a lower quality than that created by redevelopment. The different periods over which redeveloped and rehabilitated environments can offer a reasonable standard of shelter also enter the calculation in a way shown below. The point is that the validity of the policy of rehabilitation can be tested only if the cost of the policy is compared with the costs of redevelopment after deducting the cost of those additional advantages which rehabilitation cannot achieve.

9.41 Before making a choice between rehabilitation and redevelopment, it is necessary to introduce the comparative measure of the benefits accruing from each course of action. Fundamentally the benefit is the provision of shelter in an environment of acceptable standard and equipped with proper facilities. The market value of such shelter at any moment in time is given, crudely, by the gross rateable value of the dwelling although its actual value is not relied on in the method of analysis. The adequacy of the shelter will diminish over a period of years as the standard of maintenance deteriorates and as the shelter becomes less desirable in competition with new dwellings which will continue to be built, to higher standards. An analysis of the gross rateable value of dwellings in Teesside suggests that when the value of an older dwelling has fallen roughly to half the value of a newly built dwelling, it will no longer provide an adequate level of shelter. Dwellings of this value are being demolished in current slum clearance schemes.

9.42 If the renewed life of a rehabilitated dwelling is taken to be thirty years, buildings undergoing rehabilitation in the 1960's would continue to provide a reasonable standard of shelter until the 1990's, but the value of this shelter would be depreciating rapidly. The rate of depreciation can be calculated if the value of the dwelling in the first year following rehabilitation is taken to be twice its value in the thirtieth year, when the standard of the dwelling has deteriorated to the point when it will no longer give adequate shelter. The annual rate of depreciation in the value of the dwelling in these circumstances is 2.3 per cent. Of course, if the rehabilitated dwelling was assumed to have a shorter life, say, ten years, then the annual rate of depreciation would be much more rapid.

9.43 New dwellings built in the course of redevelopment or overspill would also be subject to depreciation. In their cases, however, the probable life of the dwelling before it falls below a minimum standard, is much greater. Two alternative periods have been taken for the purposes of calculation, namely sixty and eighty years. If the value of the dwelling in the last year of its effective life is one-half of that in its first year, the annual rates of depreciation would be 1.2 per cent, for sixty years; and 0.9 per cent, for eighty years.

9.44 However, it is not enough only to calculate the annual rate of depreciation in the value of a dwelling. For actuarial reasons, it is necessary also to apply a discount rate to the present worth of each year's shelter provided by a building during the period of its life. That is, even

Table 9.4. Discount and depreciation rates (annual loss of value, per cent)

type of action	assumed life (years)	depreciation no discount	depreciation, 2 per cent discount	depreciation, 3 per cent discount
rehabilitation	30	2.3	4.3	5.3
redevelopment	60	1.2	3.2	4.2
redevelopment	80	0.9	2.9	3.9

if there were no depreciation the present worth of the shelter likely to be provided in the first year of the life of the building is greater than that likely to be provided in the last years of its life for the reasons explained earlier. For these purposes, present worth can be calculated by applying a discount rate of between 2 per cent and 3 per cent per annum. By this is meant that accommodation worth £100 now would be valued at only £98 (or £97) if one has to wait a year for it, at £96 (or £94) if one has to wait two years, and so on.

9.45 These two discount rates, for depreciation and uncertainty, may be added together to give a single combined rate of the loss of value to be applied to the present worth of future services provided by the buildings. Rates of discount may be calculated for rehabilitated dwelling with a life of thirty years, and for redeveloped dwellings with a life of sixty or eighty years. They are shown in table 9.4.

9.46 It is possible, now, to calculate in actuarial terms, the comparative benefits offered by rehabilitation and by redevelopment. In each case, the benefit is the present worth at the time of construction, of the total amount of the shelter offered by each type of dwelling during the course of its economic life. The total amount of this shelter is given by adding the present worth of each year's shelter, given that this is reducing each year because of depreciation and because of discounting.

9.47 Therefore, if the present worth of the first year's shelter by any course of action is given the index value 1.0, then the present worth, at the time of taking action, of the sum total of shelter provided by the alternative types of dwelling, for the full period of its life, is shown in table 9.5. It means, for instance, that if the discount rate is 3 per cent, then the present worth of the benefits resulting from redevelopment so as to give an economic life of sixty years is twenty-two times the value placed on the first year's accommodation.

Table 9.5. Present worth of total shelter from one dwelling (assume 1st year's shelter = 1.0)

type of action	assumed life (years)	discount rate (excluding depreciation) 3 per cent	2 per cent
rehabilitation	30	15.2	17.0
redevelopment	60	22.0	26.8
redevelopment	80	24.6	31.2

9.48 A basis now exists for comparing the costs and benefits of the alternative courses of rehabilitation or redevelopment. A comparison of the benefits is given by the index numbers of the present worth of the shelter to be provided by the different types of action for their full economic life. The cost of that part of action by redevelopment that could also be met by rehabilitation is known. Therefore, rehabilitation is not worth while if:

$$\frac{\textit{cost of rehabilitation}}{\textit{present worth of rehabilitation}} > \frac{\textit{comparable cost of redevelopment}}{\textit{present worth of redevelopment}}$$

9.49 Three of the four factors in this expression are known for a variety of conditions. Therefore, the maximum cost at which rehabilitation is financially preferable to redevelopment is given as follows:

benefits:

from redevelopment, 60 years life, 3% discount rate, = 22.0V

from rehabilitation, 30 years life, 3% discount rate, = 15.2V

where V is the value of the first year's shelter, which is the same for redevelopment or rehabilitation as the comparison is confined to those improvements that can be achieved by either course of action.

costs

that part of redevelopment that achieves an improvement the equivalent of rehabilitation = £1,575 per dwelling.

The maximum cost of rehabilitation that is worth incurring is given by x where

$$\frac{x}{15.2V} = \frac{1{,}575}{22.0V}$$

$$\therefore x = £1{,}088$$

9.50 The full results, showing the maximum cost of rehabilitation that is worth incurring under alternative sets of circumstances, is given in table 9.8. In this table, the values are related back to the scores of penalty points allotted to a zone in the SHED system. Using as a guide the value of £39 per penalty point, which is the cost of remedial action, it is possible to calculate the number of penalty points that are worth correcting. For instance, if the comparison is made with redevelopment with a 80-year life, at a 3 per cent discount rate, it is worth correcting 27.9 penalty points by rehabilitation (i.e. £1,088 ÷ £39 per point). But it has been shown that only 55 per cent of the penalty points score is capable of rehabilitation. Therefore, for 27.9 points to be corrected in an area, the original score of that area must have been 42.9 penalty points (i.e. 27.8 ÷ 0.65).

Table 9.6. Penalty points per dwelling worth rehabilitation

assumed life of alternative redevelopment (years)	discount rate (per cent)	maximum cost of rehabilitation (£)	penalty points remedied	total penalty points
60	3	1,088	27.9	42.9
60	2	999	25.4	39.1
80	3	973	24.6	37.8
80	2	858	21.8	33.5

9.51 However, the range of values of the total penalty points under which rehabilitation is worth incurring is quite small, whatever the circumstances. It is reasonable therefore to suggest that an average score of about 38 penalty points indicates the dividing line between the alternatives of rehabilitation and redevelopment. That is, zones where the average penalty points per dwelling is less than 38 are those in which rehabilitation would provide a financially acceptable method of improving its environment. But those where the score is 38 or over are zones in which rehabilitation is very unlikely to provide an adequate financial return compared with that obtainable by redevelopment.

9.52 It is not suggested that in a zone with average penalty points of 37 a policy of rehabilitation will necessarily always give better value for money than will redevelopment, while for 39 points the reverse is true. Slight and reasonable modifications to the assumptions could easily shift the 'break-even' point. There are also factors which may matter but which are not in the index. What is being said is that, as a rough guide, areas in which the average score is more than 38 points will probably require too much expenditure on rehabilitation for it to be worthwhile in normal circumstances. It must be stressed as 'normal circumstances' because there may be occasions when it will make sense to rehabilitate rather than to redevelop even though the latter policy would seem to give better value for money. For example, if the rate of household formation were expected to fall in a few years time, and if consequently it was thought necessary to build more houses in the public sector in order to keep to some steady level of total house-building, then it would make sense to postpone until then some redevelopment which SHED suggests should take place now. SHED is an approximate guide, to be used intelligently in the context of wider considerations.

9.53 Four categories of zones can be identified on the basis of their housing and environmental deficiency score. They are:

a zones with a score of 38 points and over. In general, such zones would require comprehensive redevelopment;

b zones with between 12 and 38 points containing older dwellings. This type of zone is in accord with the normal concept of rehabilitation. That is, services and features either need replacing because of their obsolescence; or need repair; or need to be added as they were not included in the original development. The cost of remedying these factors is the true cost of rehabilitation, and represents a legitimate claim on the resources available for the treatment of existing residential areas;

c zones with between 12 and 38 points, containing dwellings built mainly since 1945. For these, many of the deficiencies, real though they are, represent expenditure which has yet to be made as part of the original development. In some cases, the expenditure may already be committed, say the provision of schools or shops, the landscaping of parks, or the completion of transport arrangements. Rehabilitation in this sense thus refers to the completion of an investment programme already started, rather than the renovation of outworn environments;

d finally, an arbitrary lower limit of 12 points has been set. Zones with fewer than 12 points are unlikely to require much treatment by rehabilitation, and they have thus been dismissed from further consideration.

Method of defining policy

Environmental areas

9.54 This section gives a general account of the method of defining policy. A detailed account of the method as applied to a specific environmental area, Parkfield in Stockton is given in Appendix 4.

9.55 The process of urban renewal foreshadowed by the report of the Planning Advisory Group on *The Future of Development Plans* (H.M.S.O., 1965) is that areas needing either rehabilitation or redevelopment would be treated as a series of action areas, in each of which the required treatment would be completed in a short space of time.

9.56 Any given action area might contain a mixture of dwellings, some of which would require redevelopment, some rehabilitation, and some would require no action to be taken. In some cases, too, the action might be more closely related to some other facet of urban structure policy, such as the extension of central areas or the development of the primary road system. In these cases, the needs of this type of action might take precedence over the needs of residential action. But to meet the requirements of an orderly process of renewal, action areas should each be treated as a whole in an established sequence of priority. This would be preferable to considering individual dwellings and taking action in a sequence that met the degree of urgency for treatment of houses.

9.57 Thus the action area becomes the main unit for establishing urban renewal policy. The main aims of the policy will be to define the type and likely cost of action to be undertaken in each action area, and the sequence of priority. But the action areas must be placed in the context of urban structure policy for Teesside as a whole. To this end, Teesside has been divided into a series of environmental areas, to provide a bridge between action areas and the urban structure plan, and a maximum density has been established for each environmental area, as a part of urban structure policy.

9.58 Environmental areas are the largest unit of area for which environmental considerations take precedence over the considerations of vehicular movement. A series of environmental areas have accordingly been defined, accepting that ease of pedestrian movement would be of major significance. Thus the criteria for the definition of environmental areas include:

a a primary school, and its approximate hinterland;

b a group of shops, and its hinterland,

c respect for social groupings where there is evidence for their existence;

d the exclusion of primary and secondary roads, except where they break into well-established hinterlands, in which case special treatment may prove necessary to overcome the effects of severence;

e the use of natural or man-made features that provide a barrier to easy movement and interaction.

9.59 On this basis, maps (figures 9.1 and 9.2) have been prepared of the environmental areas on Teesside. These environmental areas are based in detail upon the existing urban structure of Teesside, though they would probably remain as the broad basis for future policy. In detail, however, the boundaries may have to be changed, as the primary and secondary road systems are constructed. The detailed design of treatment for an individual action area would thus require the preparation of a district plan for the environmental area in which it is located.

Density and overspill

9.60 A series of maximum densities has been devised for the existing residential areas of Teesside, based upon experience of planning policy in general. Density policy for Teesside is discussed in chapter 11. These densities are a very broad set of criteria, to be applied to action areas. Their main purpose in this context is to provide a criterion for comparison with the existing density, so that an estimate may be made of the number of dwellings likely to be cleared which should be replaced in some other part of the urban area, as overspill. They do not therefore necessarily give a firm indication of a detailed system of densities.

9.61 Four types of area are recognised:

a central urban areas, where redevelopment would include the provision of high density, multistorey flats;

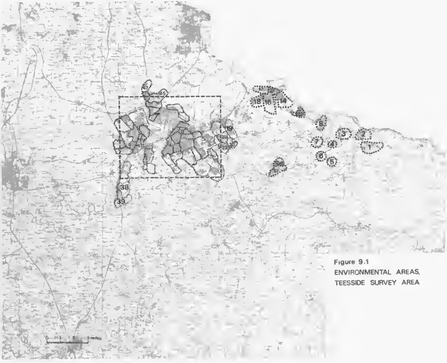


Figure 9.1
ENVIRONMENTAL AREAS,
TEESSIDE SURVEY AREA

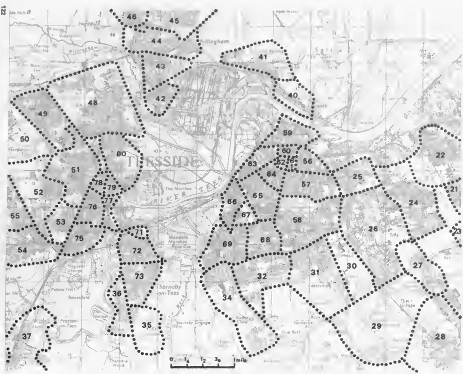


Figure 9 2
ENVIRONMENTAL AREAS
CENTRAL TEESSIDE

b urban areas, where redevelopment would be high density, low rise, including three- and four-storey dwellings;

c inner surburban areas, with two-storey terrace housing, or patio housing;

d outer suburban areas, with detached and semi-detached houses.

9.62 The ceiling densities associated with each type of development are given in table 9.7, and their geographical distribution is shown on figures 9.3 and 9.4. The maximum density is given for each category. Thus, postwar development in the outer suburbs, from which no overspill would be generated, has never exceeded 50 persons per acre net density. Therefore, this makes a suitable, maximum figure for estimating overspill.

Table 9.7. Assumed ceiling densities for the calculation of overspill

	persons per acre	dwellings per acre
central urban	128	40
urban	98	30
inner suburban	64	20
outer suburban	42	13

Note : figures are for net residential densities, at an average occupancy rate of 3.2 persons per dwelling.

9.63 The map also shows where the existing, residential use should be discontinued. These mainly are areas where other uses are likely to displace residential uses, for instance areas into which central areas or institutional uses are likely to expand. Secondly, they include areas where continued residential use is not desirable either because of atmospheric pollution or because of their severance from the main residential areas. The detailed explanation of these changes is given in part three of Volume I.

9.64 The calculation of the amount of overspill from each action area involving redevelopment is therefore a simple comparison between the actual net density (in dwellings per acre) taken from the Land Use Survey; and the ceiling net density laid down in figures 9.3 and 9.4. If the actual density is greater than the ceiling density, then the difference represents the amount of overspill, per acre. In the case of a zone where there should be a change of use, the ceiling density is zero, and the overspill equal to the entire stock of dwellings in that zone.

9.66 The evaluation is more complicated in the case of rehabilitation. In these areas, the simple difference between the actual and the ceiling densities is not sufficient as the particular deficiencies to be corrected may, in themselves, require the clearance of dwellings and overspill even though the actual density is less than the ceiling density.

9.66 For instance there could be a rehabilitation area with an average SHED score of 36 penalty points. This would indicate the need for a very intense level of rehabilitation including, almost certainly, the demolition of some of the dwellings to make way for parking and provision of public open space. These cleared dwellings would have to be replaced as overspill. There is need, therefore, for a means of establishing the likely scale of overspill. But say the real gross density in the area is 14 dwellings per acre, and its ceiling density is 15.7 dwellings per acre. Then a comparison between the two densities would suggest that there would be no overspill.

9.67 However, an examination of a number of zones shows that an area with these characteristics is untypical. Figure 9.5 shows, on a graph, that there is a close relationship between the SHED score and the gross residential density of a zone. According to the graph, zones with a SHED score of 36 points can be expected on average to have a gross residential density of 23.4 dwellings per acre which, in an area where the ceiling density is 15.7 dwellings per acre, would indicate an overspill rate of 33 per cent.

9.88 Therefore, the assumed density of a rehabilitation area, given by its SHED score and figure 9.5, is used to give an indication of the likely level of overspill. Of course, when the design study of a specific area is carried out, the final rate of overspill may well be different. But the purpose of the original calculation, using assumed densities, is to give a broad indication of the likely scale of overspill rather than a precise indication of the demolitions that may prove necessary in a specific zone.

9.69 This method is used only for these zones with a SHED score between 12 and 38 points where the majority of dwellings are more than thirty years old. It is assumed that the environmental deficiencies in areas of more recent construction are of a different nature which, as was explained paragraph 9.53, is unlikely to generate overspill.

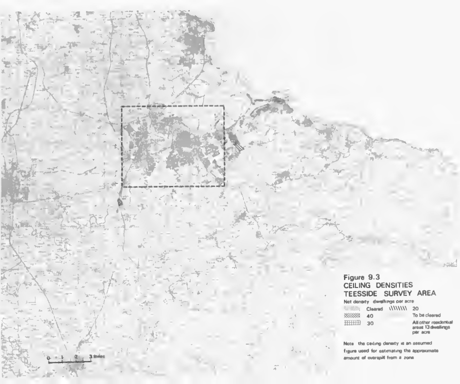
Priorities for action

9.70 The broadest criterion for the definition of priority in the treatment of action areas is the relative degree of urgency which each action area merits. The action area has been named as the smallest unit of area needing comprehensive treatment within a comparable short space of time. It is clear too that the range of treatment within a single action area might include dwellings needing redevelopment, others needing rehabilitation and, indeed, dwellings not needing any treatment. Therefore, the urgency of treatment must be a statement about the action area as a whole, unless certain specific conditions are identified which would be sufficient to give overriding priority within the residential programme. Of course, the needs of land for other uses, such as central areas or road construction, may introduce other priorities.

9.71 The simplest general statement about the merits of treating an action area with urgency is its average environmental deficiency score. The penalty points score will define the existing condition of the area, and thus its need for treatment, indicating the predominant type of action. Obviously, an action area in which the predominant action should be redevelopment is much worse than one in which action will mainly comprise rehabilitation. In principle, such an action area should be treated first.

9 72 However, this use of the environmental deficiency score is too crude. Individual factors can be identified which should receive prior treatment. Two factors, atmospheric pollution and the condition of dwellings, may each have such a high individual score of penalty points that each stigmatises an area as one with a totally unacceptable environment now, much more so than one which may have an equally high score of penalty points, the result of a combination of a number of relatively minor deficiencies, such as poor landscape, or lack of car parking facilities.

9.73 Thus any action area which has the highest possible penalty points for atmospheric pollution or for the condition of dwellings, should receive the most urgent treatment. A third factor is also sufficient, in theory, to give



0 1 2 3 miles
Net density dwellings per acre
Cleared
40
30
20
To be cleared
All other residential areas 13 dwellings per acre

Figure 9.3
CEILING DENSITIES
TEESSIDE SURVEY AREA

Note the ceiling density is an assumed figure used for estimating the approximate amount of overspill from a zone

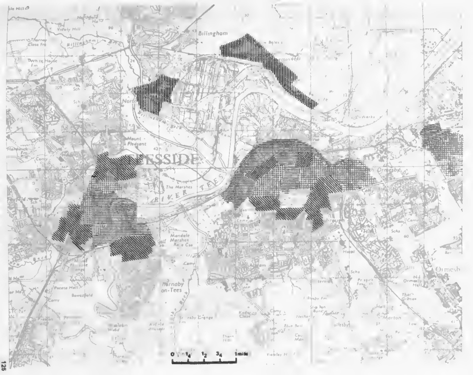
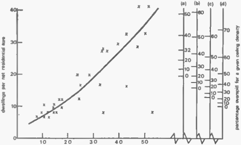


Figure 9.4
CEILING DENSITIES
CENTRAL TEESSIDE

NET DENSITY

- ▤ Cleared
- ▩ 40 dwellings per acre
- ▦ 30
- ▧ 20
- ▥ To be cleared
- All other residential areas 13 dwellings per acre

Note the ceiling density is an assumed figure used for estimating the approximate amount of overspill from a zone



note: x average net residential density and penalty points for sample zone

right hand axis shows appropriate percentage overspill for a given ceiling density (a) 40 dwellings per acre, net
(b) 30 - - -
(c) 20 - - -
(d) 13 - - -

Figure 9.5
DENSITY AND ENVIRONMENTAL DEFICIENCY

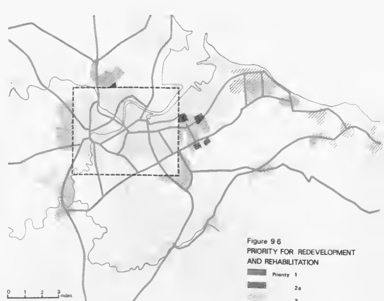


Figure 9.6
PRIORITY FOR REDEVELOPMENT AND REHABILITATION

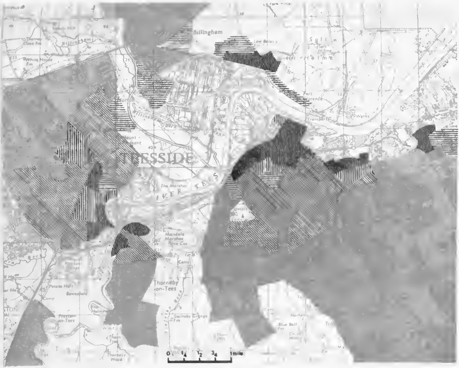


Figure 9.7
PRIORITY FOR
REDEVELOPMENT AND
REHABILITATION,
CENTRAL TEESSIDE

an area the highest priority of treatment. This is the problem of overcrowding, defined as a standard of floorspace less than the minimum provision laid down in the Parker Morris Report; or a ratio of more than one person per habitable room. These two measures can be calculated from the Land Use and Home Interview Surveys, expressed as an average statement about a basic zone. In the event, overcrowding was not found to be a problem associated with zones with a high SHED score.

9.74 Therefore a set of priorities can be formulated, as follows:

a *Priority group 1*

All action areas with a SHED score of more than 38 points and one or more of the following:

(i) condition of dwelling in class (2), with poor maintenance and structure;

(ii) heavy level of atmospheric pollution, class (2);

(iii) overcrowding in excess either of one person per room, or the Parker–Morris standard.

The action will include the redevelopment of all dwellings with a score of more than 38 points, the rehabilitation of dwellings with scores of 12–37 points; and the rehousing of any overspill produced. Priority within the group should be in rank order of environmental deficiency score.

b *Priority group 2*

(i) All action areas with a score of 12–37 points, and one or more of the factors listed in (a);

(ii) all action areas with a score of more than 38 points not so far treated.

The action will take the same form as in group 1. Priority within the group should be in rank order of environmental deficiency score within (i) and (ii) and should be balanced between them.

c *Priority group 3*

All action areas built before 1939, with a score of 12–37 points. Action and priority within the group should be as above.

d *Priority group 4*

This includes action areas comprising dwellings built since 1945. The action for these will probably form part of the current programme for new development.

The cost of action

9.75 Finally, the cost of treatment may be calculated under the various categories of action. In the case of overspill, redevelopment and infilling, the cost per unit dwelling is taken from Appendix 3; and the cost of rehabilitation is taken from Appendix 2, where the average cost was shown to be about £39 per penalty point. This figure is applied only to the deficiencies that are capable of being corrected by rehabilitation, that is, approximately 65 per cent of the total number of penalty points in a rehabilitation area. The final estimated cost of action and the recommended policy for each action area is shown in table 9.10, after the appendices to this chapter.

Appendix 1. Penalty points for housing and environmental deficiency

The items entering the survey are shown in table 9.8. Every item was derived from the Land Use Survey data except for the basic facilities of the dwelling which were taken from the Home Interview Survey. The code values and the brief description, were those entered in the surveys; the penalty points were those allotted against each deficiency.

The items incapable of remedial action by rehabilitation are marked *. They are:

a type of dwelling;

b access to dwelling;

c parking on garage provision; it was assumed that not more than three deficiency points of the maximum score of five points could be remedied, by providing extra space through clearance. This would give a minimum standard equal to slightly less than one car space per dwelling;

d privacy; that is degree to which a dwelling is overlooked by other dwellings;

e visual quality; this proved to be an error in the design of the Land Use Survey, as all areas were coded 1;

f density; only zones with an average of three or more points were assumed capable of treatment, by clearance of dwellings to reduce densities. Zones with less than twenty dwellings per acre had a density less than the minimum ceiling density;

g air pollution;

h age of dwelling.

Appendix 2. The cost of remedial action

Three different sets of schemes for which data were available were examined. In each an estimate was made of the number of SHED deficiency points that could have been remedied by the type of rehabilitation described for that problem, and the average cost of rehabilitation per penalty point was calculated at 1966 prices.

Improvements to terrace houses in Stockton-on-Tees

Details of these schemes were published in the *Architect's Journal,* 11th March 1954.

a Installation of bathroom, w.c., and hot-water system. This would correct 15 penalty points, at a cost of £540 or £36 per point.

b Conversion of four terrace houses into five flats, including structural alterations, correcting about 5 penalty points; installing bathrooms, w.c., and hot-water systems, correcting 15 penalty points, and doing some landscape treatment to backyards, correcting 2 points. This cost £940 per dwelling, or £42.5 per point.

c Conversion of three terrace houses into four flats, including more extensive structure alterations, say, 9 penalty points; installing bathrooms, w.c., and hot-water systems, 15 points; and landscaping, 2 points. The total cost was about £1,160 per dwelling, or £44.5 per point.

Deeplish, Rochdale

Details were taken from *Deeplish, Rochdale,* giving the improvement possibilities for a part of Rochdale (H.M.S.O., 1966).

a Improvement of dwellings (high level improvement scheme C)

The main problem is that, in considering the rehabilitation of dwellings, the Deeplish Study used different levels of improvement whereas the SHED system relies on a simple criterion of a single level of improvement. For this reason, probably the highest Deeplish standards should be used for assessing the correction of SHED penalty points. The scheme includes improvement of maintenance and structure, 12 points; improvement of visual appearance, 3 points; installation of bathroom, w.c., and hot-water system, 15 points. The total cost was £1,330, or £44 per point.

b Improvement of dwellings and environment (sector studies 2 and 3).

In this sector of Deeplish, several alternative schemes for rehabilitation were considered. Study 1 was minimal

Table 9.8 Penalty points for housing and environmental deficiency

name of item	code, and details		penalty points	
				maximum for each item
condition	0.	maintenance and structure good	0	
	1.	maintenance poor, structure good	5	
	2	maintenance and structure poor	12	12
basic facilities	0.	no fixed bath	5	5
	1.	no hot-water system	5	5
	2	no internal w c.	5	5
*type	0.	detached	0	
	1.	semi-detached	0	
	2.	terrace	1	1
*house access	0.	two entrance doors	3	
	1.	one entrance door	0	3
outdoor private space	0.	front and back garden/yard	0	
	1.	back garden/yard only	3	
	2.	front garden/yard only	3	
	3.	no front or back garden/yard	8	8
*parking garage provision	0.	more than one car space per d.u	0	
	1.	one car space per d.u.	1	
	2.	less than one car space per d.u.	5	5
maximum penalty points for the dwelling				44
*privacy	0.	no overlooking on either side	0	
	1.	overlooking on one side	2	
	2.	overlooking on both sides	5	5
noise	0.	normal residential standard	0	
	1.	above residential but not industrial/commercial standard	2	
	2.	industrial/commercial (e g. main street) standard	5	5
traffic	0.	normal residential traffic	0	
	1.	above normal residential traffic	3	
	2.	large amount of industrial and through traffic	5	6
*visual quality	0.	higher standard than environment	0	
	1.	same standard as environment	1	
	2.	lower standard than environment	3	3
access to public open space	0.	park/P.O.S. within 5 mins. walk	0	
	1.	no P.O.S. within 5 mins. walk	3	3
access to shops and primary schools	0.	primary school and shops within 5 mins. walk	0	
	1.	primary school but no shops within 5 mins walk	2	
	2.	shops but no primary school within 5 mins. walk	5	
	3.	no primary school or shops within 5 mins. walk	7	7
access to public transport to major centre	0.	less than 3 mins. walk	0	
	1.	more than 3 mins. walk	3	
*density	0.	less than 10 d.u.'s per acre	0	
	1.	10 to 19 d.u.'s per acre	1	
	2.	20 to 29 d.u.'s per acre	3	
	3.	30 d.u.'s or over per acre	7	7
*air pollution	0.	negligible	0	
	1.	light	3	
	2.	heavy	9	9
*age	0.	post war	0	
	1.	1918–1939	1	
	2.	1895–1914	2	
	3.	pre-1895	3	3
landscape quality	0.	mature, good quality, abundant landscape	0	
	1.	immature insufficient amounts	2	
	2.	total or almost total lack of landscape	5	5
maximum penalty points for the environment				56
maximum penalty points for the dwelling and the environment				100

but studies 2 and 3 were to a higher standard comparable with that in SHED. This sector would have a score of 44 penalty points on the SHED system of which, in theory, 65 per cent, or 29, would be capable of rehabilitation. In fact, Study 2 would have remedied about 17 points, at a cost of £33 per point. Study 3 would have remedied 34 points at a cost of £44.6 per point, including the extensive rehabilitation of dwellings; clearance and provision of parking space; alterations to the circulation system; and landscape treatment.

Southfield, Middlesbrough

This was a preliminary sketch plan for the rehabilitation of an area of houses south of the central area of Middlesbrough, with a SHED score of 35 points. It was not the scheme finally prepared for Southfield, described in Volume I, Chapter 12. Rough estimates can be made of the cost of rehabilitation, as follows:

a acquisition of dwellings for slum clearance, and to provide parking provision and open space: 632 dwellings @ £300 per dwelling	£159,600
b clearance of dwellings and site works: 12 acres @ £6,385 per acre	£76,600
c provision of parking spaces for the remaining dwellings: 1,268 dwellings @ £60 per car space	£76,000
d landscaping provision for the remaining dwellings: 1,268 dwellings @ £20 per dwelling	£25,360
e improvements to maintenance and structure of dwellings and provision of basic facilities: say, improvement of 12 penalty points per dwelling at £44 per point (from Deeplish)	£670,000
total cost	£1,007,560
average cost per dwelling	£795

By this means, a total of 25 points would be remedied, as follows, expressed as an average number of points per dwelling.

reduction in density	2 points
provision of parking space	4 „
improved outdoor private space	2 „
improved access to public open space	2 „
improved landscape quality	3 „
improved dwellings	12 „
total	26 „

Therefore, the average cost is £31.8 per point.

Appendix 3. The average cost of redevelopment and overspill

Overspill development

It is assumed that development is at a net density of about 50 persons per acre; and average occupancy of 3.6 persons per dwelling; or 14.3 dwellings per acre. Costs are at 1966 prices. The average cost per dwelling, at 1966 prices, is approximately:

a land acquisition, £2,500 per acre, net residential areas	£175
b dwelling construction, £670 per person	£2,000
c services and site works, £125 per person	£435
d landscaping and open space, including land acquisition	£115
e local shopping	£20
f primary schools, including land acquisition	£175
total	£2,920

The estimates are based on local figures, obtained from valuers and quantity surveyors working in the North East. The Circular on *Housing Standards, Costs and Subsidies*, issued by the Ministry of Housing and Local Government (Circular 36/67), was published after the bulk of the calculation had been completed. It quotes a figure of £699 for items (b) and (c). This was sufficiently similar for the original figures to stand, as the £699 is a *per capita* cost.

Redevelopment

The cost covers the full cost of the compulsory acquisition, clearance and redevelopment of the site, including the full provision of those uses entering calculations of gross residential density. It was assumed that redevelopment would be at a net density of 115 persons per acre and an occupancy rate of 3.5 persons per dwelling. This is a relatively high density and later work, especially the detailed study on Parkfield, Stockton, (see volume I, chapter 12), showed that actual net densities would probably be lower. Costs per dwelling, at 1966 prices, are as follows:

a compulsory acquisition of land, dwellings, £2,100 per acre, gross residential areas	£122
b clearance, £6,385 per acre, gross residential areas	£372
c dwelling construction, £620 per person	£2,170
d services and site works, £77 per person	£270
e landscaping for open space, excluding land acquisition	£20
f local shopping	£20
g replacement of some primary schools	£60
total	£3,030

These estimates are based on local figures. The figures in Circular 36/67 are higher than those used in this calculation. Their effect on the analysis would be to raise the cost of redevelopment to about £3,440 per dwelling. This would have the consequential effect of raising the maximum SHED score at which rehabilitation would be worthwhile to about 43 points instead of 38 points, if the expected life of rehabilitation were thirty years.

The definition of the maximum number of penalty points at which rehabilitation is worthwhile depends on two main factors, the cost of redevelopment and the assumed life of the rehabilitated area. Thus, if the cost of redevelopment were taken to be £3,440 per dwelling, it would be necessary to assume that the rehabilitated area were only twenty-five years, instead of thirty years, if the division between rehabilitation and redevelopment were to remain at about 38 penalty points.

The calculation demonstrating this is:

a if the total cost of redevelopment is £3,440 per dwelling the cost of redeveloping those deficiencies that are also capable of being remedied by rehabilitation is £1.790, because of lower standards and because only 65 per cent of the total amount of deficiency could be corrected by rehabilitation;

b if the extended life of a rehabilitated dwelling is twenty-five years, its annual rate of depreciation is 2.8 per cent and the total shelter, or present worth of the dwelling is between 13.3 and 14.7 times the value of the first year's shelter depending on the rate of discount;

c therefore, the maximum cost of rehabilitation that is worth undertaking will be between £763 and £1,200 per dwelling, corresponding to a range of between 30 and 47 penalty points or an average of about 38 points

This revised calculation demonstrates the close relationship between the cost per dwelling of redevelopment and the extended life of a dwelling that is gained by rehabilitation. At this stage, there seems little reason for departing from a standard of about 38 penalty points for defining the breakpoint between redevelopment and rehabilitation. The purpose of the analysis is to give a broad indication of the necessary type of action and a clearer indication of the priority for treating different areas.

Appendix 4. Detailed example of the definition of policy

The full method of the calculation and definition of policy for a single environmental area is given in table 9.9. The chosen environmental area is Parkfield, Stockton, which is also the subject of a design study in Volume I, chapter 12, showing the further application of the recommended policy.

The successive stages in the calculation are listed in numerical sequence in the table and are described below. It is important to realise that this full method was developed during the period of survey and analysis. If it were required, a simplified procedure could be devised in the light of the experience gained during that period.

Stages 1–4: Reference numbers

1 the environmental area number.

2 the action area number.

3 the basic zone number. This is the basic unit for which data are collected and recorded; action area data are calculated by adding the data for basic zones and, if necessary, a basic zone has been split between several action areas.

4 the fine zone number; this is a simplified system of 211 zones, grouping together, in each case, several basic zones.

Stages 5–9: Definition of priority

5 SHED score: the score for the action area is the weighted average of the basic zone scores, which are taken from the computer print out.

6 condition of dwelling: this is taken from the Land Use Survey and the figure gives the modal value of all dwellings in the basic zone (see Appendix 1 for the code values).

7 overcrowding indicates, if coded 'Yes', that there is more than one person per room, from the Home Interview Survey; or a space standard below that of the Parker Morris Report, family size taken from the Home Interview Survey, and space from the Land Use Survey.

8 atmospheric pollution is taken from the Land Use Survey (see Appendix 1 for the code values).

9 priority of treatment for action, according to the criteria given in paragraph 9.74.

Stages 10–11: Density information

10 ceiling density, from figures 9.3 and 9.4.

11 rate of overspill:

a basic zone 2201, action area 75.1. This involves a change of use for part of the zone, and the overspill is derived partly from this, partly from the ceiling density;

b basic zone 2303, action area 75.2. The SHED score is 33.1 points; the assumed density is calculated from this score, and therefore the relevant rate of overspill for that ceiling density, namely 24 per cent. The figures are calculated from the graph on figure 9.5.

c basic zone 2306, action area 75.4. This zone contains two classes of dwellings:

(i) there are 212 dwellings with a SHED score in excess of 38 points, therefore needing comprehensive

Table 9.9. The definition of policy for rehabilitation and redevelopment: Parkfield, Stockton

1. environmental area	75 Parkfield, Stockton										
2. action area	75–1			75–2			75–3	75–4	75–5		
3. basic zone (*: part only)	*2201	2202	total	*2303	2305	total	*2304	*2306	*2306	2308	total
4. fine zone	124	124		125	125		126	127	127	127	
5. SHED score (penalty points)	35.2	55.8	53.5	33.1	36.7	36.0	36.8	35.5	29.5	23.3	26.1
6. condition of dwelling	0	0	0	1	1	1	1	0	0	0	0
7. overcrowding	–	–	–	–	–	–	–	–	–	–	–
8. pollution level	2	2	2	1	1	1	1	1	1	1	1
9. priority for action			1			3	3	3			3
10. ceiling density (net, persons per acre)	100	100		100	70		100	70	70	50	
11. percentage overspill	81	15		24	39		18	21	28	22	
number of dwellings											
12. before action	60	498	558	112	481	593	411	430	160	198	358
13. overspill	49	75	124	27	188	215	78	90	45	44	89
14. remaining	11	423	434	85	293	378	333	340	115	154	269
15. no action	0	0	0	0	0	0	0	0	0	0	0
16. needing treatment	11	423	424	85	293	378	333	340	115	154	269
17. rehabilitation	11	0	11	85	293	378	247	218	115	154	269
18. redevelopment	0	423	423	0	0	0	86	122	0	0	0
19. new land	0	0	0	0	0	0	0	0	0	0	0
20. after action			434			378	333	340			269
rehabilitation											
21. remedial points per dwelling	20.2	0		21.6	12.2		20.8	19.3	19.3	15.4	
22. cost per dwelling (£'s)	788	0		842	474		810	754	754	802	
cost of action (£'000's, 1966 prices)											
23. overspill	143	219	362	79	549	828	228	263	131	128	258
24. rehabilitation	8	0	9	72	139	211	200	164	87	90	177
25. redevelopment	0	1,282	1,262	0	0	0	261	370	0	0	0
26. new land			0			0	0	0			0
27. special action			0			0	0	0			0
28. TOTAL			1,653			838	889	797			438

clearance. The rate of overspill, 12 per cent, is given by the difference between the ceiling density and the real density, given in the Land Use Survey;

(ii) there are also 218 dwellings with a SHED score between 12 and 38 points, therefore needing rehabilitation. The graph on figure 9.5 shows that the rate of overspill from an area with this SHED score is 30 per cent;

(iii) the rate of overspill from the whole basic zone is the weighted average of these two specific rates, namely 21 per cent. The rate must be expressed as an average of the two classes of dwellings will be intermingled and it is not possible to say how much of the overspill is generated by one part of the zone.

Stages 12–20: Number of dwellings

12 the number of dwellings in the zone at the time of survey.

13 the amount of overspill, given by applying the percentage in stage 11 to the number of dwellings in stage 12.

14 the number of dwellings remaining after overspill has been deducted.

15 the number of dwellings with a SHED score of less than 12 points. The number of sample dwellings is taken from the computer print out, and the current expansion factor applied to give the total number of dwellings.

16 the number of dwellings which will remain after either their redevelopment or their rehabilitation is given by deducting stage 15 from stage 14.

17 the potential number of dwellings which will be affected by rehabilitation, whether of the dwelling or its environment, is the number of sample dwellings with a SHED score of between 12 and 37 points, expanded by the relevant expansion factor:

a if this potential number is greater than or equal to that given in stage 16, then the number given in stage 16 is the number of dwellings for rehabilitation;

b if the potential number is less than that in stage 16, then the potential number is the total number of dwellings for rehabilitation.

18 the number of dwellings that can be replaced by redevelopment is given by the difference between stages 16 and 17. That is, there will be a replacement of dwellings only if the number of dwellings for rehabilitation is less than that given in stage 16.

19 this gives the number of new dwellings which could be constructed on infill sites that are available within the main environmental areas.

20 this gives the final number of dwellings in an area after overspill, rehabilitation, redevelopment and infill have all been completed.

Stages 21–22: Rehabilitation

21 the number of remedial points equals 65 per cent of the average SHED penalty points of the dwellings in the basic zone in the rehabilitation category, that is between 12 and 37 points. The number of points is given in the computer print out. It is not the average SHED score of all dwellings in the zone.

22 the average cost per dwelling of rehabilitation is equal to stage 21 times the average cost per point, that is, £39.

Stages 23–28: Cost of action

23 the cost of overspill is the number of dwellings in stage 13 multiplied by the average cost of £2,920 per dwelling.

24 the cost of rehabilitation is the number of dwellings in stage 17 times the average cost per dwelling from item 22.

25 the cost of redevelopment is the average cost, £3,030 per dwelling, times the number of dwellings in stage 18.

26 the cost of new dwellings, as infill, is taken to be the equivalent of redevelopment, that is, £3,030 times the number of dwellings in stage 19.

27 certain special costs should be included in cases where dwellings are demolished because of poor quality, but no alternative economic use of the site is available. That is, the cleared land cannot form part of the general environment of a gross residential area, nor is it likely to be needed for the expansion of a central area, or road works, or other uses. An allowance has been made for clearance and planting in these areas but, in fact, there are very few such areas.

26 the final total cost of the action is given in this stage.

Table 9.10. Policy recommendations for redevelopment and rehabilitation, Teesside

action area	SHED score	number of dwellings before action	after action	number of dwellings, type of action overspill	redevelopment	rehabilitation	no action	infill	cost of action (£'000's)
Priority group 1									
72.1	61.7	178	75	104	75	–	–	–	531
60.1	61.4	226	–	226	–	–	–	–	660
60.2	60.0	381	–	381	–	–	–	–	1,113
75.1	53 5	558	434	124	423	11	–	–	1,652
58.1	53 3	843	167	676	167	–	–	–	2 501
72.2	52.8	640	221	419	221	–	–	–	1,936
63.1	52.5	1,524	–	1,524	–	–	–	–	4,450
74.1	52.4	56	–	56	–	–	–	–	169
62.1	51.1	607	–	607	–	–	–	–	1 772
22.1	46.8	1,873	261	1,592	261	–	–	–	5,670
78.1	46 6	49	–	49	–	–	–	–	143
25.1	46 5	1,710	603	1,107	385	218	–	–	4,842
41.1	46.0	223	80	163	–	60	–	–	524
19.1	45 4	1,264	359	805	50	308	–	–	3,024
59.1	44.8	123	–	123	–	–	–	–	387
61.1	42.9	120	–	120	–	–	–	–	350
77.1	39.1	216	–	216	–	–	–	–	631
59.2	39 0	361	361	–	200	181	–	–	740
71.1	38.4	298	–	298	–	–	–	–	1,062
TOTAL		11,253	2,561	8,692	1,802	769	–	–	31,977

action area	SHED score	number of dwellings		number of dwellings, type of action					cost of action (£'000's)
		before action	after action	overspill	redevelopment	rehabilitation	no action	infill	
Priority group 2(a)									
79.1	37.2	281	281	–	100	181	–	–	447
59.4	37.0	76	76	–	–	76	–	–	73
64.3	37.0	1,055	702	353	20	682	–	–	1,662
86.1	36.8	765	–	765	–	–	–	–	2,292
40.1	36.4	151	54	97	–	54	–	–	320
41.2	29.8	464	261	203	–	261	–	–	786
40.2	29.6	273	158	115	–	158	–	–	460
44.2	29.3	496	496	–	–	496	–	–	386
19.2	29.1	482	415	67	–	415	–	–	504
22.2	27.2	1,032	351	581	–	269	82	–	2,303
42.1	28.3	674	485	218	–	458	–	–	953
48.4	24.5	662	581	81	–	581	–	–	618
20.1	22.9	565	463	102	–	463	–	–	571
43.1	21.4	272	272	–	15	227	30	–	175
23.1	20.3	540	502	38	–	389	113	–	341
TOTAL		7,808	5,070	2,738	135	4,710	225	–	11,690
Priority group 2(b)									
64.2	44.1	1,090	737	353	437	300	–	–	2,813
76.4	43.1	376	244	132	173	71	–	–	974
64.1	42.5	647	330	317	136	194	–	–	1,609
76.3	42.2	58	–	56	–	–	–	–	164
25.2	39.7	941	762	265	236	440	–	86	2,133
76.5	39.7	857	637	220	137	500	–	–	1,488
76.1	39.6	191	–	191	–	–	–	–	556
51.3	39.1	299	233	66	152	81	–	–	706
77.2	38.9	89	–	69	–	–	–	–	201
78.2	38.5	150	–	150	–	–	–	–	436
TOTAL		4,678	2,943	1,819	1,271	1,586	–	86	10,784
Priority group 3									
57.1	37.9	540	284	256	34	250	–	–	1,061
55.1	37.8	650	487	163	130	357	–	–	1,172
72.3	36.9	811	462	349	–	462	–	–	1,419
75.3	36.8	411	333	78	86	247	–	–	688
57.2	36.6	1,544	481	1,063	58	403	–	–	3,678
2.1	36.4	780	524	256	94	430	–	–	1,353
72.7	36.3	649	429	220	163	223	43	–	1,269
75.2	36.0	593	378	215	–	378	–	–	838
75.4	35.5	430	340	90	122	218	–	–	797
65.2	35.0	1,770	714	1,056	64	850	–	–	3,811
65.3	34.8	741	527	214	16	511	–	–	1,091
80.1	34.7	861	780	280	–	597	4	179	1,794
58.2	34.7	1,365	1,078	287	41	1,037	–	–	1820
15.1	34.5	1,358	585	773	14	571	–	–	2,892
72.6	34.1	616	513	103	113	400	–	–	940
57.4	32.7	203	164	39	23	141	–	–	283
53.1	31.8	1,018	776	239	258	475	48	–	1,751
72.5	30.9	338	237	101	–	237	–	–	478
25.3	30.2	552	760	55	82	435	–	263	1,447
3.1	29.9	380	215	165	–	215	–	–	648
57.3	29.5	487	410	77	–	410	–	–	530
85.4	28.1	726	552	174	–	552	–	–	905
80.3	27.1	578	370	208	–	370	–	–	860
11.1	26.9	900	585	315	–	585	–	–	1,322
39.1	26.5	237	190	47	–	190	–	–	266
51.1	25.4	737	529	251	–	486	–	43	1,193
17.1	26.3	644	409	236	–	334	75	–	967
75.5	26.1	358	269	89	–	289	–	–	437
57.5	24.1	512	455	57	–	455	–	–	452
53.2	24.0	202	164	46	–	83	71	–	197
3.2	24.0	959	821	148	–	821	–	–	940
68.1	23.7	809	863	146	–	507	56	–	803
60.2	22.8	825	702	123	–	882	20	–	751
4.1	21.2	350	301	49	–	301	–	–	317
1.1	21.0	1,998	1,579	420	–	839	940	–	1,700
18.2	20.8	1,367	1,159	208	–	1,101	58	–	1,214
8.2	19.1	380	327	53	–	187	140	–	257
52.1	18.4	530	530	–	–	530	–	–	254
48.1	17.8	2,101	1,968	202	–	1,619	280	59	1,591
58.5	17.0	21	21	–	–	21	–	–	9
8.4	17.0	283	255	28	–	105	150	–	145
58.8	15.9	1,307	1,293	14	–	1,080	213	–	522
8.1	15.8	510	474	36	–	139	335	–	189
58.7	14.8	618	618	–	–	468	150	–	205
51.4	14.9	1,272	1,234	38	–	717	517	–	288
69.1	14.8	735	735	–	–	480	255	–	223
68.3	14.3	376	357	19	–	163	194	–	143
52.2	14.1	203	203	–	–	135	67	–	58
58.2	13.5	240	240	–	–	134	106	–	59
18.1	13.4	971	971	–	–	545	426	–	252
14.1	11.8	566	566	–	–	148	418	–	68
58.2	10.8	520	520	–	–	100	420	–	39
TOTAL		37,943	29,510	8,987	1,278	22,694	4,368	554	48,204

Table 9.10—cont.

ection area	SHED score	number of dwellings before action	after action	number of dwellings, type of action overspill	redevelopment	rehabilitation	no action	infill	cost of action (£ 000's)
Priority group 4									
56.2	28.5	526	–	526	–	–	–	–	1,642
22.4	25.0	512	543	–	67	445	–	31	564
22.3	24.7	162	407	–	–	162	–	245	850
66.2	24.5	503	443	60	–	443	–	–	467
7.1	23.1	1,283	1,219	64	–	1,219	–	–	949
22.5	20.4	355	355	–	–	323	32	–	189
26.2	20.3	1,142	1,142	–	–	1,092	50	–	611
21.2	19.3	424	424	–	–	359	65	–	205
50.1	19.2	164	164	–	–	123	41	–	58
20.2	19.0	1,142	1,449	11	–	923	208	318	1,500
43.2	19.0	1,212	1,212	–	–	1,086	126	–	600
24.1	18.5	180	180	–	–	160	–	–	92
50.2	18.4	2,023	2,023	–	–	1,889	134	–	988
49.2	18.3	945	945	–	–	669	256	–	382
19.4	18.3	974	1,445	–	–	924	50	471	1,506
36.1	18.2	474	589	–	–	366	68	215	864
55.2	18.1	600	600	–	–	500	–	–	301
31.3	18.0	1,573	1,573	–	–	1,370	203	–	724
35.1	17.9	160	150	–	–	110	50	–	65
34.2	17.8	397	397	–	–	377	20	–	152
31.2	17.8	709	708	–	–	706	–	–	358
45.2	17.7	1,678	1,678	–	–	1,324	354	–	728
49.3	17.1	925	925	–	–	705	220	–	367
14.2	17.0	1,572	1,494	84	–	757	737	–	728
31.4	16.6	240	240	–	–	228	12	–	97
69.3	16.5	449	449	–	–	371	78	–	184
25.3	16.5	664	664	–	–	507	157	–	256
58.1	16.4	492	482	–	18	327	137	–	228
26.1	16.0	1,365	1,365	–	–	1,021	344	–	501
59.4	15.7	753	746	7	–	555	191	–	291
26.4	15.6	2,767	2,767	–	–	2,373	394	–	1,104
46.2	15.5	705	654	21	–	520	164	–	309
19.3	15.4	659	659	–	–	567	92	–	256
49.3	15.4	1,378	1,379	–	–	1,002	376	–	498
18.1	15.0	767	757	–	–	576	151	–	270
16.2	15.0	2,360	2,360	–	–	1,522	838	–	767
47.1	14.9	532	632	–	–	508	24	–	218
54.1	14.5	959	959	–	–	620	339	–	286
34.1	14.4	924	924	–	–	629	295	–	283
37.2	14.0	599	575	24	–	192	383	–	172
73.1	13.9	508	749	–	–	305	203	240	867
64.3	13.9	364	354	–	–	266	98	–	117
24.3	13.9	1,551	1,551	–	–	820	731	–	401
39.2	13.8	460	480	–	–	480	–	–	191
9.1	13.7	1,295	1,256	39	–	547	709	–	428
44.1	13.7	1,608	1,608	–	–	757	851	–	377
73.3	13.6	636	636	–	–	363	273	–	169
55.1	13.6	546	546	–	–	427	119	–	182
24.2	13.6	1,238	1,238	–	–	864	374	–	362
10.1	13.4	900	855	45	–	313	542	–	310
73.2	13.4	499	495	–	–	328	174	–	140
51.2	13.4	676	676	–	–	378	288	–	173
32.1	13.4	971	971	–	–	627	344	–	279
58.3	13.1	496	496	–	–	256	240	–	124
12.1	12.9	1,126	1,101	25	–	187	914	–	176
69.4	12.8	783	763	–	–	410	373	–	176
54.2	12.7	455	456	–	–	258	197	–	107
46.1	12.6	934	934	–	–	517	417	–	225
27.1	12.4	902	902	–	–	451	451	–	188
32.2	12.4	955	865	–	–	468	397	–	192
46.1	12.4	1,900	1,900	–	–	933	957	–	408
31.1	12.3	548	648	–	–	209	339	–	91
43.1	12.2	250	250	–	–	75	176	–	31
27.2	12.1	487	487	–	–	150	337	–	72
34.4	12.0	956	956	–	–	387	569	–	173
37.1	11.9	798	798	–	–	203	595	–	94
73.4	11.8	1,171	1,171	–	–	415	756	–	186
28.1	11.5	2,056	2,056	–	–	687	1,369	–	318
38.1	11.4	447	436	11	–	34	402	–	64
55.3	11.4	1,595	1,595	–	–	408	1,187	–	172
23.2	10.9	1,071	1,071	–	–	467	604	–	203
29.1	10.8	1,278	1,245	33	–	167	1,078	–	192
32.3	10.6	266	250	–	–	116	140	–	65
21.1	10.5	741	741	–	–	218	526	–	92
69.2	10.3	564	564	–	–	170	394	–	62
14.3	9.7	1,028	1,028	–	–	144	684	–	63
14.4	9.7	926	828	–	–	400	526	–	172
34.3	9.3	649	648	–	–	123	525	–	61
TOTAL		68,798	69,388	952	85	42,035	25,728	1,520	28,649

10 Housing programme

Definition of a housing programme

10.1 This chapter contains an account of the four main aspects that have been investigated about future house building programmes on Teesside. First, a housing balance sheet is set up for the period 1966–91. In this, the existing stock of dwellings and the losses due to the policy for clearance and rehabilitation of housing areas are calculated. The other side of the balance sheet is the demand for new dwellings arising from household formation and from a housing market in which houses are readily available, reflected in a higher rate of vacant dwellings and a reduction in the sharing of dwellings. At the end, the balance sheet shows that 104,000 new dwellings will be needed of which 28,000 are to replace cleared dwellings; 58,000 are new dwellings needed for the population growth by natural increase; and 18,000 new dwellings are likely to be needed for the migrant population.

10.2 This balance sheet total then has to be translated into a phased building programme. The population and migration forecasts can be phased by demographic analysis to give a clear picture of the necessary building rates. But the replacement of cleared houses is a very different type of problem. The total requirement could amount to between 25 and 35 per cent of the demand made upon the construction industry if due allowance is made for the resources needed for rehabilitation. In the end, a programme is recommended whereby the annual rates of new house construction would rise from 4,100 in 1966–71 to 4,600 in 1976–81 and fall back to 3,800 in 1986–91; but the fall in new house building is counterbalanced by a rise in the annual amount of work on rehabilitation such that the total demands made on the construction industry show a steady rise over the period.

10.3 Some of the implications of this programme are then examined. First, the need to achieve a steady construction programme without a pronounced slump in building activity means that the rehabilitation programme would be spread over a longer period than is strictly desirable either on social or on physical grounds. This could result in a progressive deterioration in the quality of old housing areas such that many houses now thought to be capable of rehabilitation would have to be demolished.

10.4 A second implication concerns the division of the programme for new house building between the public and the private sectors, assuming that the public sector continues to be responsible for rehousing the majority of the families in houses to be demolished. At present, local authorities are responsible for between 40 and 50 per cent of the new houses constructed on Teesside. The private sector builds between 1,800 and 2,100 new houses each year and the local authorities, between 1,200 and 1,700. In the next ten years, the local authorities will have to build 2,300 new houses per year on average, or 55 per cent of the total programme.

10.5 Finally, an analysis of the likely future distribution of family sizes (in terms of persons) shows that the greatest increase in demand for new dwellings will come from small households of one, two and three persons. These will include both young and old households. But an analysis of the existing distribution of dwelling sizes (in terms of habitable rooms) shows that it is more related to the needs of larger households. There is evidence that there will be an increasing shortage of dwellings suitable for small households. This is difficult to measure because rising standards of living, and shortages in the supply of suitably sized dwellings, both mean that an exact coincidence between the distribution of family sizes and dwelling sizes is very unlikely to be achieved or to be desired. However, a considerable proportion of local authority dwellings should, in future, have one to four rooms.

The housing balance sheet

10.6 The first indication of the needs of a house construction programme can be given by the preparation of a housing balance sheet, showing the demand for new houses to be constructed between 1966 and 1991. Six items enter this balance sheet:

a the existing stock of dwellings;

b the demand for new dwellings arising from population growth;

c the expected numbers of vacant dwellings;

d the reduction of sharing of dwellings;

e the needs of the programme for the redevelopment and rehabilitation of the existing stock;

f and clearances caused by the needs of the road construction programme and other changes in land use.

10.7 The existing stock of dwellings is 144,920 according to the Land Use Survey. This was carried out between September 1965 and April 1966 and is therefore a statement about the stock at December 1965. Forecasting needs make it necessary to estimate the stock of dwellings in June 1968. Approximately 1,530 new dwellings were completed, and 820 dwellings were demolished in the first six months of 1966. Thus, there were about 145,630 dwellings on Teesside in June 1966.

10.8 The recommended forecast of the number of households in 1991 was 212,800 households, representing a need to accommodate a further 65,400 households between 1986 and 1991. This forecast was based on the final population forecast and the high assumption about future headship rates. The final population forecast contains a sizeable element of migrant population, amounting to 62,000 by 1991 in the total forecast population of 704,000. It is clear that the migrant element in the final population forecast is a much less certain element than the element comprising the natural increase of the established population. It was noted in chapter 8 that the migrant element had a very large effect on the forecast net increase of households between 1966 and 1991. The net increase including migrants is 65,400; excluding migrants, it is 48,580. Therefore in this section the statistics are based on the recommended household forecast of 212,800 households, but figures are also given excluding the migrant element.

10.9 The most recent and reliable estimate of vacant dwellings on Teesside is the 1961 Census of Population. At that time 2,450, or 1.82 per cent of the total dwellings, were vacant. The implications to be drawn from studies such as D. V. Donnison's *The Government of Housing*, 1967) is that a greater vacancy rate should be assumed in future to allow for a relatively easy market in housing. This is important if net inward migration to Teesside is to be encouraged. Therefore a figure of 4 per cent has been taken for estimating the number of vacant dwellings at 1991. This would mean an increase of about 6,000 in the total of vacant dwellings on Teesside by 1991.

10.10 Comparatively few households were sharing a single dwelling in 1966 according to the definition of households used in chapter 8. The number was estimated at about 4,500 households by comparing the number of occupied dwellings from the Land Use Survey and the likely number of households. This comparison excluded those one-person households which it is assumed will wish to continue to share a dwelling.

10.11 The needs of the rehabilitation programme were set out in chapter 9. In total, this involved the clearance, and replacement, of 27,760 and the rehabilitation of 71,780 dwellings. The average cost of this work of rehabilitation is about £580 per dwelling though it will be greater for the more serious cases, and less for the more superficial examples. As the average cost of a new, redeveloped dwelling is £3,030 per dwelling, then rehabilitation costs about 19 per cent of that of redevelopment. It is useful, therefore, to express the demand for resources for the rehabilitation of 71,780 dwellings as the equivalent of the construction of 13,606 complete new dwellings, or 19 per cent of the total number to be rehabilitated.

10.12 Finally, in theory, allowance should be made for clearing dwellings whose sites are required for other land uses or road works. The greatest need for this type of clearance is in the older residential areas. Due allowance has been made for changes of use in these areas as part of the redevelopment and rehabilitation programme. Therefore no further allowance is made for this category.

10.13 The full housing balance sheet is in table 10.1. It shows two main features. First is the considerable significance of the migrant element. It is clear that the migration record of Teesside must be constantly reviewed and the housing programme adjusted as necessary in the light of such reviews. Second, if the construction needs for the next twenty-five years are expressed as an average annual rate, new dwellings would be needed at an annual rate of between 2,800 and 3,100 dwellings; replacement would take an additional 1,100 dwellings, and rehabilitation, the equivalent of 550 dwellings a year. These rates are rather more than has been achieved in the last five years when, on average, 3,500 new dwellings have been built each year (see table 10.2).

Table 10.1. Housing balance sheet, Teesside, 1966–91 (dwellings)

	based on total population forecast	based on natural increase of population excluding immigration
existing stock, 1966	146,630	145,630
additional needs, 1966–91		
household formation	65,400	48,580
elimination of sharing	4,500	4,500
vacancies	6,100	5,350
estimated stock, 1991	221,630	204,060
new construction needs, 1966–91		
additional needs	76,000	58,430
replacement	27,760	27,760
total, new dwellings	103,760	86,190
total, rehabilitation, in terms of equivalent dwelling units	13,610	13,610

Note: rehabilitation, equivalent dwelling units, defined in paragraph 10.11 and table 10.5.

Table 10.2. Numbers of dwellings completed, Teesside, 1954–67 (number of dwellings)

year	local authority	private builders'	total	slum clearances
1954–55	2,485	782	3,267	•
1955–56	2,272	885	3,157	236
1956–57	1,449	1,024	2,473	188
1957–58	1,725	1,031	2,756	338
1958–59	1,951	1,383	3,334	758
1959–60	1,704	1,652	3,356	825
1960–61	1,363	2,087	3,450	717
1961–62	1,498	2,187	3,685	778
1962–63	1,262	1,847	3,109	820
1963–64	1,671	2,005	3,676	820
1964–65	1,657	2,101	3,758	678
1965–66	1,183	1,872	3,055	1,574
1966–67	1,355	2,421	3,776	1,080

Source: Ministry of Housing and Local Government, *Quarterly Housing Return.*

Notes: Figures are for the Teesside Population Area;
• no data available.

The housing construction programme

10.14 It is not valid to strike an average annual rate of construction for a period as long as twenty-five years. The most suitable way of arriving at the programme is to work in five-year periods as the forecasts of household formation are made for these periods. The first three sources of need, for household formation, vacancies, and sharing are relatively simple to phase. They are tied to population growth and therefore not very susceptible to variations of policy. The last source of need, the rehabilitation and redevelopment programme is much more difficult to phase, as the decision is a matter of policy.

10.15 The phasing of the additional need for dwellings for household formation is given in table 10.3. The need for new dwellings shows a steady increase, both relatively and absolutely, until about 1981. There is then a slackening off in the early and middle 1980s. This pattern is more or less the same for both the total population and the population excluding the migrant element. The reason for this lies mainly in the demographic structure of the population. But, as J. Parry

Table 10.3. Household formation, Teesside, 1966–91 (numbers of dwellings)

	total population forecast	excluding migration
1966–71	9,420	7,740
1971–76	12,530	8,960
1976–81	14,720	10,740
1981–86	13,860	10,200
1986–91	14,890	10,740
TOTAL	65,420	48,560

Lewis shows in his book, *Building Cycles and Britain's Growth* (1965), the national picture is different. The decline in the rate of household formation seems likely to come early, in the 1970's, and the decline is more marked. This reflects differences between the Teesside and the national age structure.

10.16 For the completeness of the statistics it is necessary to make estimates of the quinquennial increase in the supply of vacant dwellings based on the total need for dwellings, and the gradual process of amelioration of sharing. These assumptions are somewhat arbitrary; they are shown in table 10.4.

Table 10.4. Vacancies and elimination of sharing, Teesside, 1966–91 (numbers of dwellings)

	increase of vacant dwellings		
	total population forecast	excluding migration	increase in dwellings to eliminate sharing
1966–71	500	450	300
1971–76	1,100	950	400
1976–81	1,300	1,150	850
1981–86	1,100	950	1,000
1986–91	2,100	1,650	1,950
TOTAL	6,100	5,350	4,500

10.17 Finally there is the problem of phasing the programme of redevelopment and rehabilitation. In devising the programme, the amount of work on rehabilitation of the dwelling and its environment, expressed in terms of the number of dwellings in affected areas in chapter 9, has been translated into an equivalent number of dwellings for calculating the amount of resources that will be required from the construction industry. The calculation is in table 10.5.

Table 10.5. Estimated equivalent number of dwelling units for rehabilitation, Teesside

priority group (a)	SHED score in points (b)	number of dwellings in areas to be rehabilitated (c)	average cost per dwelling of rehabilitation (£) (d)	equivalent number of dwelling units (e)
1	38	759	1,401	351
2a	20–37.9	4,710	740	1,150
2b	38	1,588	856	448
3	30–37.9	8,022	742	1,964
3	20–29.9	8,100	674	1,802
3	10–19.9	5,572	453	981
4	20–29.9	3,664	605	735
4	10–19.9	38,351	489	6,175
average		71,784	575	13,608

Note: column (e), equivalent number of dwelling units

$$= \frac{\text{col. (c)} \times \text{col. (d)},}{3{,}030}$$

where £3,030 is the average cost of a new dwelling in a redevelopment area.

It is vital to remember that in any one area, clearance, redevelopment and rehabilitation proceed concurrently as part of a single process and, until a detailed action area plan has been prepared, it is not possible to assume that the three types of action can take place at different times.

10.18 In devising a programme, the following factors have to be borne in mind:

a the rehabilitation policy has been calculated on the assumption that the life of these dwellings is extended by thirty years, provided that the action is taken reasonably swiftly, that is before further decay should set in causing a rise in the SHED penalty points score for an area;

b it will probably take several years for the necessary climate of opinion to be created and legislation passed for the effective implementation of the rehabilitation policy;

c it is desirable to avoid fluctuations in the forecast rate of demand for resources from the construction industry. Admittedly, the programme may rely in part on resources that are not local to Teesside whether by use of industrialised building methods or by attracting national contractors. But the greater part of the programme is likely to rely on local firms and the local authorities;

d the demand for new dwellings by the growing population shows a steady rate of increase until the early 1980's when, because of demographic factors, the rate of increase slackens, though the rate of increase starts to rise again in the late 1980's. This dip occurs in both the forecast of total increase in population and that excluding the migrant population.

10.19 The housing construction programme that best satisfies all four factors is shown in table 10.6. Its main feature is a steady and gradual increase in the total demand for resources over the entire period though after 1981 an increasing proportion of this is for rehabilitation while the actual number of new dwellings shows a slight fall. The main bulk of the rehabilitation work does not start until 1971 by which time legislative arrangements could have been made for its implementation. Most of the urgent work on rehabilitation would be completed by about 1982 leaving the easier priority group 3, and the priority group 4 work for the 1980's (see table 10.9).

10.20 This programme is therefore recommended in preference to either of the alternative courses of action. A more rapid programme is illustrated in table 10.7 such that the most urgent rehabilitation is completed by the mid-1970's, five years earlier than in the recommended programme, but at the cost of a sharp fall in the total demand made upon the construction industry in the 1980's and an even greater fall in the number of new houses being built.

10.21 A third alternative is shown in table 10.8. In this it is assumed that the clearance and replacement of dwellings continues at about its present rate. A probable consequence of this would be that action would be so deferred on some of the less urgent areas, by a matter of five years compared with the recommended, or ten years compared with the rapid, programme, that their condition and environment would have further deteriorated to a point where rehabilitation was no longer financially worthwhile. Very roughly, it has been assumed that this delay would add about eight penalty points to the SHED score. As a consequence, the number of dwellings needing to be demolished and replaced might rise from about 28,000 to 39,000 though the equivalent number of rehabilitation dwellings would fall from 14,000 to 11,000. That is, the total demand for resources would increase slightly but the number of new dwellings to be constructed would show a sharp increase. Thus this programme fails in three respects. It causes an increase in the total resources required; it delays action, leading

Table 10.6. Recommended housing construction programme, Teesside, 1966–91 (dwellings)

	1966–71		1971–76		1976–81		1981–86		1986–91		1966–91	
		sub-total		sub-total		sub-total		sub-total		sub-total		sub-total
demand for new dwellings												
household formation (incl. migrants)	9,420		12,530		14,720		13,860		14,890		65,420	
reduction of sharing	300		400		850		1,000		1,950		4,500	
vacancies	500	10,220	1,100	14,030	1,300	16,870	1,100	15,960	2,100	18,940	6,100	76,020
redevelopment and rehabilitation												
priority group 1, replacement	10,490										10,490	
rehabilitation	350	10,840									350	10,840
priority group 2, replacement			5,960								5,960	
rehabilitation			1,600	7,560							1,600	7,560
priority group 3, replacement			1,040		5,450		3,770				10,260	
rehabilitation			290	1,330	1,500	6,950	2,960	6,730			4,750	15,010
priority group 4, replacement							720		320		1,040	
rehabilitation							730	1,450	6,170	6,490	6,910	7,950
sub-total												
replacement	10,490		7,010		5,450		4,490		320		27,760	
rehabilitation	350	10,840	1,890	8,900	1,500	6,950	3,690	8,180	6,170	6,490	13,610	41,360
total demand for construction												
new dwellings (incl. replacement)		20,710		21,040		22,320		20,450		19,260		103,760
rehabilitation		350		1,890		1,500		3,690		6,170		13,610
TOTAL		21,060		22,930		23,820		24,140		25,430		117,380

Notes: figures are for total number of dwellings constructed in five-year period including equivalent number of dwelling units for rehabilitation, all figures are rounded.

Table 10.7. Alternative, rapid housing construction programme, Teesside, 1966–91 (dwellings)

	1966–71		1971–76		1976–81		1981–86		1986–91		1966–91	
		sub-total		sub-total		sub-total		sub-total		sub-total		sub-total
demand for new dwellings												
household formation (incl migrants)	9,420		12,530		14,720		13,860		14,890		65,420	
reduction of sharing	300		400		850		1,000		1,950		4,500	
vacancies	500	10,220	1,100	14,030	1,300	16,870	1,100	15,960	2,100	18,940	6,100	76,020
redevelopment and rehabilitation												
priority group 1, replacement	10,490										10,490	
rehabilitation	350	10,840									350	10,840
priority group 2, replacement			5,960								5,960	
rehabilitation			1,600	7,560							1,600	7,560
priority group 3, replacement			4,400		5,860						10,260	
rehabilitation			1,210	5,610	3,530	9,390					4,750	15,010
priority group 4, replacement					720		320				1,040	
rehabilitation					730	1,450	6,170	6,490			6,910	7,950
sub-total												
replacement	10,490		10,360		6,580		320				27,760	
rehabilitation	350	10,840	2,810	13,180	4,270	10,850	6,170	6,490			13,610	41,360
total demand for construction												
new dwellings (incl. replacement)		20,710		24,390		23,450		16,280		18,940		103,760
rehabilitation		350		2,810		4,270		6,170		0		13,610
TOTAL		21,060		27,210		27,720		22,450		18,940		117,380

Notes:* see note, table 10.6.
all figures are rounded.

Table 10.8. Alternative, delayed housing construction programme, Teesside, 1966–91 (dwellings)

	1966–71		1971–76		1976–81		1981–86		1986–91		1966–91	
		sub-total		sub-total		sub-total		sub-total		sub-total		sub-total
demand for new dwellings												
household formation (incl. migrants)	9,420		12,530		14,720		13,860		14,880		65,420	
reduction of sharing	300		400		850		1,000		1,850		4,600	
vacancies	500	10,220	1,100	14,030	1,300	18,870	1,100	15,980	2,100	18,840	6,100	78,020
redevelopment and rehabilitation												
priority group 1, replacement	8,000		3,250								11,250	
rehabilitation	0	8,000	0	3,250							0	11,250
priority group 2, replacement			4,800		3,740						8,540	
rehabilitation			0	4,800	910	4,650					910	9,450
priority group 3, replacement					4,260		8,000		6,030		18,280	
rehabilitation					0	4,260	0	8,000	2,780	8,810	2,780	21,070
priority group 4, replacement									1,040		1,040	
rehabilitation*									6,910	7,950	6,910	7,950
sub-total												
replacement	8,000		8,050		8,000		8,000		7,060		39,120	
rehabilitation	0	8,000	0	8,050	910	8,910	0	8,000	9,690	16,780	10,600	49,720
total demand for construction												
new dwellings (incl. replacement)		18,220		22,080		24,870		23,960		28,000		116,140
rehabilitation*		0		0		910		0		9,690		10,600
TOTAL		18,220		22,080		26,780		23,960		35,700		126,740

Notes. * see note, table 10.8, in these circumstances, the rehabilitation of priority dwellings would go beyond 1991.
all figures are rounded.

Table 10.9. Approximate starting dates of action for housing priority groups

priority group	rapid action	recommended action	delayed action
1	1966–67	1966–67	1966–67
2	1971–72	1971–72	1973–74
3, over 30 points	1974–75	1975–76	1978–79
3, under 30 points	1977–78	1981–82	1987–88
4, over 20 points	1980–81	1986–85	1989–90
4, under 20 points	1981–82	1986–87	1990–91

to social injustice; and it creates fluctuations both in the demand for new dwellings and in the demand for total resources.

10.22 The final, recommended rates of new house construction and the necessary resources for rehabilitation (expressed in terms of dwelling units) are shown in table 10.10. These are average annual rates and some variation is likely within each quinquenium. The effects of the migration element are also shown, for comparison.

10.23 A comparison between this programme and the record of the last few years shows that the clearance and replacement rate in the first five years represents a faster rate than has been achieved on Teesside. However, the rate of increase between 1964 and 1966 shows that a further increase is probably feasible particularly if the necessary land is available for redevelopment or overspill.

10.24 The conclusion to be drawn from this programme is that it probably does not represent a rate of increase that is likely to be beyond the resources of Teesside. The real problem lies in the first ten years when the rate of increase is most rapid because of the accelerated programme of clearances. As most of the burden for this programme is likely to fall on the public sector, it is therefore necessary to look more closely at the demand for local authority houses during the period 1966–76.

The local authority housing programme

10.26 An examination of the needs for the local authority sector is vital if land is to be available for redevelopment and for the housing of overspill, on which the programme for rehabilitation depends. This forecast can reasonably be made only for a ten-year period as, beyond that time, it is not possible to be certain about the likely demand for local authority houses. For convenience, the local authorities which will be managing the housing programmes in the Teesside Survey Area are considered together as if they were a single authority.

10.26 There were about 45,000 local authority dwellings on Teesside in 1966 or 30 per cent of the total stock. About 36,000 of these have been built since 1945 and the whole stock is in reasonably good condition. Some of the older dwellings are deficient in equipment and space by modern standards and most

Table 10.10. Housing programme, Teesside, 1966–91 (average number of dwellings per annum)

	1966–71	1971–76	1976–81	1981–86	1986–91
new dwellings:					
household formation, vacancies and sharing					
by natural increase	1,700	2,080	2,590	2,430	2,910
by migration	350	740	790	760	880
replacement of clearances	2,100	1,400	1,090	900	80
sub-total	4,140	4,210	4,460	4,090	3,850
rehabilitation programme	70	380	600	740	1,230
TOTAL	4,210	4,580	4,960	4,830	5,090

Notes: rehabilitation programme is in terms of equivalent number of new dwellings.
all figures are rounded.

are likely to be found wanting in provision for the motor car. But the dwellings represent a substantial stock of low cost, rented accommodation.

10.27 At the present time, about 1,500 local authority dwellings are built each year, to satisfy three types of demand.

a Rehousing households displaced by slum clearance programmes. Most of these households have low incomes and are not in a position to buy a dwelling when their homes are demolished. They are rehoused by the local authority therefore, and in recent years over 50 per cent of the net annual increase in the local authority dwelling stock has gone to such households. About 90 per cent of slum clearance households go into the local authority sector.

b Providing low cost housing for households in need, on the local authority general waiting lists. This was the most important element in the total housing programme after World War II, but it has been declining rapidly in recent years, and the waiting lists are now very small by comparison with the postwar years. This reflects first of all the very impressive record of local authority house construction on Teesside since 1945, involving about 35,000 dwellings. Secondly, and basically, this changed situation reflects the postwar increase in real incomes which has brought home ownership within the reach of an increasing proportion of households, and the Government's encouragement of home-ownership in recent years. A rough estimate has been made of the proportion of the net annual increase in households that has gone into the local authority sector in recent years, excluding slum clearance households. This was done from the statistics on housing completions and estimates of the net annual increase in households in recent years. From this it appears that around 30 per cent of the net increase goes into the local authority sector, the rest into owner-occupation and the dwindling supply of private rented dwellings.

c Most recently some of the Teesside local authorities have branched out into the field of building medium-cost unsubsidised dwellings. Some were let at an economic rent. The demand for these flats suggest that there is a substantial latent demand for such housing. Also, some local authorities have begun building medium-cost dwellings for sale. Both of these activities are on a small scale but could increase.

10.28 Table 10.2 gives details of local authority construction rates since 1954; it shows the general decline in the proportion of local authority total construction since 1954. Current construction is at the rate of around 1,500 dwellings per annum, of which about 800 are for slum clearance households, the remainder for the general waiting list. In most of the Teesside authorities proposals are in hand to increase the house building rate in the current programme.

10.29 The housing forecast for the next ten years, 1966–76, is given in table 10.11 for the various sources of demand. Considering each of these in turn, it is noted first that recently 90 per cent of households in clearance areas have been rehoused by the local authority. It is likely that most of the burden of rehousing families affected by future clearance schemes will continue to be borne by the local authority. Although a forecast has been made that real incomes will rise and that personal expenditure on housing will rise in proportion these households are, on average, the poorest on Teesside. They contain a significant proportion of old persons. It would be unwise to assume that there will be any fall in the proportion of the affected families that will have to be rehoused in local authority dwellings. If the proportion continues at 90 per cent, then about 15,500 local authority dwellings will be required to rehouse families from cleared dwellings.

Table 10.11. Housing programme, Teesside, 1966–76 (numbers of dwellings)

replacement of cleared dwellings	17,500
net increase in households, by natural increase	16,700
net increase in households, by migration	5,250
relief of sharing, increase in vacancies	2,300
TOTAL	41,750
TOTAL, rehabilitation, equivalent dwellings	2,240

10.30 Considering next the net increase in households, about 30 per cent of this category moves into local authority dwellings at the present time. On the basis of previous arguments it would seem likely that this proportion would decrease in future, but several factors may counter the trend. The first is changes in the composition of the net increase in households. It was made clear in chapter 8 that old persons, and also the younger non-married persons, are likely to form a slowly increasing proportion of total households. It is likely that the extra households may be less able to afford home-ownership than the others, and also it may be that such groups will find suitable accommodation hard to come by in the private sector. Another factor is the proposed programme of rehabilitation. This may upset the market for lower cost owner-occupied dwellings, leading to a greater pressure on the local authority sector. In view of these uncertainties it is felt that the local authority should allow for a slightly increased proportion of the net increase in households to move into the local authority sector, say, 7,000 dwellings in the next ten years.

10.31 After making a small allowance for the relief of sharing, it seems likely that the local authority sector should be responsible for the construction of 23,000 new dwellings in the next ten years, or 55 per cent of the total, assuming that migration follows its charted course. This represents an average construction rate of 2,300 new dwellings per annum, of which 1,600 would be for replacement, and 700 for general purposes. It leaves for the private sector a construction rate of 1,900 new dwellings per annum. Of course, the balance between the private and public sectors cannot be precisely forecast and some variation is possible in these figures. The variation could be caused by factors relating to housing policy including questions of subsidy and home ownership; or the level of resources made available for the public sector.

10.32 These rates can be compared with the record of the last five years. Between 1962 and 1967, the average rate of new construction was 1,500 dwellings per annum of which 800 were for replacement, and 700 for general purposes. The recommended future rate of clearance was nearly achieved in 1965–66 and the drop in the subsequent year was probably due mainly to a shortage of land. This suggests that an average rate over a ten-year period of 2,300 new dwellings per annum should be capable of implementation through a gradual build up, provided that land is available for redevelopment and overspill. The rate for the private sector, at 1,900 dwellings per annum, is slightly less than the average of the last five years, at 2,050 per annum.

10.33 There is, however, the additional problem of rehabilitation. It will require resources equal to a construction rate of seventy new dwellings per annum in 1966–71, nearly 400 per annum in 1971–76. This work is likely to be divided between the public and private sectors. The local authority would be responsible for traffic and parking arrangements, landscaping and open spaces, street lighting, and paving, and the like. The private sector would probably be responsible for the improvement of the dwellings themselves, though probably with the aid of improvement grants from the public sector. In such a situation, about half the rehabilitation work in the first ten years would be for the dwelling, and half for the environment.

10.34 The final division of responsibility for rehabilitation work between the two sectors depends upon many factors. An important one is the degree of owner occupation in the rehabilitation areas. In the two study areas, it proved to be 60 per cent in Waterloo Road, Middlesbrough, and 70 per cent in Parkfield, Stockton. A second factor is the extensive degree to which improvement grants have already been made, although strictly the survey made allowance for these before assessing the level of deficiency in an area. But suitable financial and legislative arrangements will have to be made before the full rehabilitation programme could be implemented.

The size of new dwellings

10.35 A further stage in the definition of a policy for housing construction is to consider the rate of dwellings of different sizes that should be constructed in the future, given forecasts of the likely future distribution of sizes of households. At the national level, this problem is discussed fully in D. V. Donnison's book, referred to earlier. At the level of Teesside, information is potentially available in the records of the Home Interview Survey that would enable a thorough analysis to be made. However, as this problem does not directly affect urban structure policy, the relevant data were not extracted from the records. Therefore, only a crude analysis is presented in this section, using data from the 1961 Census of Population. But a full study should be made.

10.36 The analysis relies on a comparison between the size of dwelling, in terms of habitable rooms, and the size of household, in terms of persons. These measures are the most convenient because of the availability of data, though other measures of the size of dwelling might have been better.

10.37 The stock on Teesside in 1961 was mainly of four-, five- and six-roomed dwellings. This represented a small change since 1951 when most dwellings were of three, four and five rooms (see table 10.12). But if the general stock of dwellings shows a comparatively limited range of sizes, the stock of local authority dwellings is composed to an even greater extent of a standard product. About 90 per cent of the local authority dwellings on Teesside in 1964 had two or three bedrooms according to the *Annual Statistics* of the Institute of Municipal Treasurers and Accountants.

Table 10.12. Sizes of dwellings, Teesside, 1951–61 (per cent)

number of rooms per dwelling	1951	1961
1	1	1
2	6	3
3	14	7
4	31	30
5	35	43
6	9	12
7 and over	4	4

Source: Census of Population, 1951, 1961, *County Volumes*, for Teesside Population Area.

10.38 At the present time, the overwhelming majority of dwellings under construction are 'family' dwellings of four or, mainly, five rooms with only a small percentage of larger or smaller units. In recent years, local authorities have begun to build more old peoples' dwellings and some small flats, and private builders have built a small number of three- and four-roomed bungalows and flats for sale, but this process has only just begun.

10.39 The distribution of household sizes on Teesside in 1951 and 1961 is given in table 10.13. It shows that the proportion of small households is substantial and increasing at the expense of the proportion of large households. However, it would be unreasonable to expect an exact degree of coincidence between the size of dwelling and the size of household according to some arbitrary standard. The relationship between these two factors is given in table 10.14. It shows that there was a substantial amount of theoretical under-occupation of large dwellings by small households. Local data were not taken from the records of the Home Interview Survey but it is likely that many of these households are ageing married couples and widowed people whose families have grown up and left their home, or single persons who may have inherited a large house. Probably, many of these households do not want this amount of space but they are unable to obtain a smaller dwelling because of the acute shortage. If this is true, then this underoccupation represents a major waste of resources. An additional explanation is that with rising real incomes, there is an increasing demand for additional space.

Table 10.13. Sizes of households, Teesside, 1951–61 (per cent)

number of persons per household	1951	1961
1	6	11
2	23	26
3	24	22
4	21	20
5	12	11
6	8	5
7 and over	6	5

Source: Census of Population, 1951, 1961, *County Volumes*, for Teesside Population Area.

Table 10.14. Relationship between size of dwelling and household, 1961 (per cent)

persons per household	rooms per dwelling							
	1	2	3	4	5	6	7 and over	total
1	3	11	13	37	26	7	3	100
2	3	4	6	35	36	10	3	100
3	–	1	7	33	43	12	3	100
4	–	1	4	26	52	13	4	100
5	–	–	4	21	56	13	6	100
6	–	–	3	20	57	13	7	100
7 and over	–	–	2	17	54	17	10	100

Source: Census of Population, 1961, *County Volumes*, for Teesside Population Area.

10.40 Conversely, a certain amount of overcrowding is apparent amongst the larger households, for instance, those occupying four-roomed dwellings. There is clearly a shortage of large dwellings though it is numerically less serious than the shortage of small dwellings and is probably related to the comparative poverty of many larger households and their inability to afford more space.

10.41 The future stock of dwellings will be affected by two factors. The first is the clearance and rehabilitation programme which will mainly affect the older dwellings, which tend, on Teesside, to be smaller dwellings (see table 10.15). It is probable therefore that the clearance programme will effect mainly the stock of smaller dwellings. This may be offset by the rehabilitation programme in so far that five-room dwellings may be converted into four rooms where the third bedroom is made into a bathroom. It is difficult to be precise about this in the absence of detailed, local design studies but the net effect of the clearance and rehabilitation schemes, could be that about 40 per cent of the dwellings with one to four rooms would be demolished but only about 10 per cent of the dwellings with five or more rooms. The effect of a disproportionate demolition of small dwellings in the existing stock would be intensified if current trends continue for most of the new dwellings under construction to be medium sized, with five or six rooms.

Table 10.15. Average size of dwellings, by date of construction, Teesside, 1966 (rooms per dwelling)

pre-1895	4.0
1895–1914	4.5
1919–1939	4.5
post-1945	4.6

Source: Land Use and Home Interview Surveys.

10.42 Secondly the likely future distribution of household sizes shows a continuation and intensification of the current trend for the proportion of small households in the population to rise. It was shown, in chapter 8, that between 1966 and 1991 the number of small households of one to three persons is likely to rise by about 40 per cent, that is twice the expected rate of increase in the number of larger households.

10.43 These two trends demonstrate that, in general, there is likely to be an increasing amount of underoccupancy in the future unless deliberate steps are taken to encourage the construction of more small dwellings. However, the general argument should be taken with caution because standards of occupancy have been rising, and are likely to continue to rise. That is, as family incomes rise, and as the demand for household goods rises, an increasing amount of space is likely to be demanded, as was demonstrated in the Parker Morris Report. Secondly, the inertia of people and their tendency to continue living in the house in which they brought up their children is likely to continue to be a major cause of underoccupancy.

10.44 The situation within the local authority sector is likely to be more extreme. A high proportion of the existing stock of local authority dwellings was built between 1945 and the present day. It is possible that many of these dwellings will be occupied during the next twenty-five years by their current tenants, a situation which would lead to a falling household size as their children grow up and leave home. Secondly, household sizes in the future clearance areas are smaller than average, partly because the households contain a greater proportion of old people. These will be the major source of demand for local authority dwellings. On both counts therefore there is a case for an urgent review of housing policy by the local authorities probably with a view to the construction of a greater proportion of small dwellings.

10.45 It is not possible to go further than this with the data that are currently available. But the Home Interview Survey records and Census sources should be used to make a rigorous analysis of household size, age, structure and income in relation to dwelling size and tenancy arrangements.

10.46 The effect of this construction programme on the stock of dwellings on Teesside is likely to be as shown in table 10.16. The average age of dwelling in 1966 was about 39 years but, by 1991, it will have fallen to about 35 years. If, however, dwellings continue to be built of the same average size in the period 1966–91 as they have been since 1945, the average size of dwelling would have increased from 4.46 rooms per dwelling in 1966 to 4.57 rooms in 1991.

Table 10.16. Age of dwellings, Teesside, 1966 and 1991 (numbers of dwellings)

date of construction	stock in 1966	stock in 1991
pre-1895	23,000	3,000
1895–1914	35,000	27,000
1919–1939	30,000	30,000
1945–1966	56,000	56,000
1966–1991	0	104,000
TOTAL (rounded)	146,000	222,000

11 Residential land and the distribution of population

Distribution of population

11.1 The geographical distribution of population at 1966 and for the recommended urban structure at 1991 was estimated for the fine zone system of 211 zones within the Teesside Survey Area for the purposes of land use and transportation analysis. This section contains a description of the method of estimating the male, female and total population in each zone by making separate estimates of the population in private and in non-private households. A summary of the results, giving the 1966 and 1991 forecast distribution of population and dwellings for the coarse zone system is given in table 11.1.

11.2 The same principle underlies all the estimates, namely that of deriving a total figure for the Teesside Survey Area, the so-called 'control', and then distributing the control figure between the 211 zones. The control figures for the estimates are in table 11.2.

Table 11.2. Estimated total dwellings and population, Teesside, 1966–91

	male	female	total
population in 1966			
private households	229,018	239,000	468,018
non-private households	6,105	4,747	10,852
TOTAL	235,123	243,747	478,870
population in 1991			
private households	346,038	341,092	687,130
non-private households	6,900	7,800	16,700
TOTAL	354,938	348,892	703,830
total dwellings in 1966			144,920
total dwellings in 1991			221,630

Sources: population in 1966: private households, Home Interview Survey; total, Registrar General's mid-year estimate; non-private households, residual calculations.
population in 1991: total, population forecast, Volume II, chapter 1; private/non-private division, estimated.
total dwellings in 1966: Land Use Survey.
total dwellings in 1991: housing forecast, Volume II, chapter 10.

Population in 1966

11.3 The control figures of the population in private households are taken from the results of the Home Interview Survey, checked against the Registrar General's mid-year estimates and the population forecasts given in Volume II, chapter 1. Data on the population, by sex, for individual fine zones were available only from the Home Interview Survey. The mean population of a fine zone was about 2,200 but the variation was considerable, eighty-three zones having a probable population of less than 1,000 and fifty-three zones having less than 500 population. The small size of the population in many zones, and the small size of the sample (one in fifteen households were interviewed) means that the Home Interview Survey estimates of the population in many individual zones were subject to wide margins of sampling error.

11.4 Data were also available from the Home Interview Survey for the fifty-eight coarse zones, aggregations of groups of fine zones. The average size of population in a coarse zone was about 8,100. The greater size of zone means that the sampling errors are smaller and the data more reliable.

11.5 The Land Use Survey, on the other hand, was not a sample survey and was not therefore subject to sampling errors. Accordingly, the method of estimating the population in each fine zone was as follows:

total population = number of dwellings × occupancy rate (persons per household).

male population = total population × sex ratio (percentage of males in total population).

The occupancy rate and the sex ratio were those for the coarse zone in which the individual fine zone was located.

11.6 The 1966 control figure of the population in non-private households was estimated by a comparison between the Registrar General's Mid-Year Estimates for 1965 and 1966 and the Home Interview Survey results. These showed that the size of this population was about 11,000 persons or 2.3 per cent of the total population. This proportion was comparable with that for 1961 according to the Census of Population. The structure of this population in 1961 was shown in table 1.4. It was assumed that the structure of the population was the same in 1966 as in 1961. It was distributed between the 211 fine zones according to the distribution of the main types of institution as shown in the Land Use Survey.

Occupancy rates and the distribution of population in 1991

11.7 It was assumed that the proportion of population in non-private households would still be 2.3 per cent in 1991, as there were no types of institution on Teesside 1966 whose future was in serious doubt, for instance, defence establishments. It was assumed, too, that the structure of this population would remain roughly constant. Its distribution between zones was then calculated on an approximate basis by reference to the likely distribution of institutions such as hospitals, or the university, within urban structure policy.

11.8 The remaining population, about 687,000, was that living in private households in 1991. Its distribution was estimated by the same general method as for

Table 11.1. Distribution of dwellings and population, by coarse zone, Teesside, 1966–91

	number of dwellings				total population	
coarse zone (1991 system)	1966	net overspill	new sites	1991	1966	1991
1	3 400	2,690	–	620	11,090	3,020
2	7 650	4,690	–	2,860	22,660	6,480
3	3,960	130	–	3,760	12,660	11,730
4	660	120	–	440	2,330	1,360
5	530	350	–	190	1,920	610
6	7,310	2,520	–	4,800	20,930	13,760
7	6 720	–	140	6,870	36,330	27,810
8	6,210	380	–	6,860	22,140	20,640
9	5,220	–	1,650	7,070	16,030	23,930
10	2,570	–	110	2,690	9,020	6,640
11	2,330	–	3,960	6,290	7,660	19,590
12	140	–	1,230	1,390	670	4,590
13	700	450	–	240	2,990	1,720
14	6,220	3,020	670	3,770	21,160	10,630
15	6,160	150	2,190	7,200	17,890	22,550
16	350	–	1,600	1,960	1,080	6,120
17	20	–	–	20	60	50
18	1,350	370	640	1,520	4,810	4,740
19	6,120	–	2,460	8,570	21,000	28,910
20	2,650	220	–	2,440	6,240	6,990
21	430	210	–	220	1,500	660
22	540	80	–	460	1,670	1,440
23	5,000	600	1,360	6,980	16,700	16,810
24	40	–	–	40	110	120
25	4,530	–	1,720	6,250	16,200	20,840
26	3,760	360	600	4,010	12,000	11,460
27	1,460	360	–	1,090	4,600	3,190
28	620	520	–	–	1,630	250
29	3,750	1,110	–	2,630	11,410	7,660
30	4,350	290	380	4,450	13,010	13,890
31	1,640	–	880	2,620	6,230	7,840
32	60	60	–	–	240	–
33	310	310	–	–	1,030	–
34	6,270	1,260	–	3,990	16,630	11,510
35	1,630	–	2,900	4,540	6,020	13,100
36	20	–	10,200	10,220	60	34,090
37	750	60	3,420	4,120	2,240	13,990
38	230	–	11,620	11,860	590	40,100
39	60	–	–	60	190	160
40	20	–	300	320	60	1,000
41	100	–	370	460	260	1,660
42	980	–	680	1,450	2,340	4,620
43	310	–	6,890	7,200	1,120	22,100
44	170	–	–	170	410	660
45	640	30	5,260	6,100	2,860	19,740
46	1,640	–	7,600	8,140	6,070	31,200
47	1,360	–	530	1,910	4,610	6,970
48	90	–	–	90	350	270
49	160	–	–	160	530	460
50	60	–	–	60	170	2,170
51	540	–	–	540	1,760	1,540
52	3,640	340	3,360	6,670	12,210	20,690
53	7,620	1,090	640	7,070	23,170	20,470
54	3,290	–	3 720	7,010	10,480	23,180
55	4,540	160	5,620	9 900	14,130	30,690
56	1,920	440	1,050	2 540	5,140	7,270
57	6,360	710	2,090	6,720	16,140	19 220
58	100	–	–	100	340	360
59	2,320	–	600	2,920	9,030	11,130
60	490	–	–	490	1,610	1,390
61	290	–	60	350	900	1,000
62	220	–	–	220	600	620
63	120	–	–	120	410	400
64	170	–	560	730	530	2,100
65	650	20	–	670	2,140	1,640
66	1,260	10	1,740	2,390	3,780	9,360
67	860	–	400	1,260	2,700	3,630
68	–	–	–	–	–	–
69	1,160	–	920	2,080	3,960	6,810
70	130	–	9,360	9490	410	31,940
TOTAL	145,620	23,190	93,190	221,630	476,870	703 930

1966. That is, the likely numbers of dwellings in each fine zone by 1991 was calculated as follows:

number of dwellings in a fine zone in 1966,
– overspill resulting from clearance, redevelopment and rehabilitation,
+ numbers of dwellings likely to be built on land committed for residential development,
+ number of dwellings likely to be built on additional land recommended for residential development.

The method of calculating overspill, in terms of dwellings, was described in chapter 9; the control figure of the total number of new dwellings to be constructed, in chapter 10; and the distribution of the new dwellings in the latter sections of this chapter.

11.9 The key problem in estimating the distribution of population was to make a reasoned assumption about occupancy rates in 1991. Analysis of the Home Interview Survey data showed that in 1966 the median occupancy rate for coarse zones was 3.2 persons per occupied dwelling; the interquartile range was ±0.4 persons; and the extreme range was 1.9–4.3 persons. Two variables were significant in explaining the variation, namely, the date of construction and whether or not the dwelling was built by the local authority (see table 11.3).

Table 11.3. Occupancy rates, Teesside, 1966 (persons per occupied dwelling)

date of construction	age in 1966 (years)	local authority dwellings	private dwellings	average, all dwellings
pre-1895	over 70	–	3.1	3.1
1895–1914	50–70	–	3.0	3.0
1919–1939	25–45	3.3	3.1	3.2
1945–1966	0–20	3.5	3.1	3.5

Source: Home Interview and Land Use Surveys, fine zone data
Note: occupancy rates are based on modal values for each fine zone.

11.10 The geographical distribution of dwellings according to their date of construction is shown in figure 11.1. The map shows the older settlements along the banks of the river Tees and the spread of more recent housing away from the river. The modal value of the likely age of dwellings in each fine zone at 1991 can be estimated by reference to the modal value in 1966, illustrated in the figure, and the numbers of dwellings to be cleared or built in each zone, either because of commitments, or because of further planning proposals.

11.11 It is not possible, however, to make a reasonable prediction of how many of the newly built dwellings may be in the local authority sector and the modal age alone was used to predict 1991 occupancy rates. It was shown in chapter 8 that there is unlikely to be a substantial change in average household size between 1966 and 1991. But the proportion of vacant dwellings in the total stock should rise to about 4 per cent by 1991. Therefore the rates in the last column of table 11.4 were used.

Table 11.4. Predicted occupancy rates, Teesside, 1991 (persons per dwelling)

date of construction	age in 1991 (years)	occupied dwellings	all dwellings
pre-1939	over 50	3.0	2.9
1945–76	15–45	3.2	3.2*
1976–91	0–15	3.5	3.4

Note: * rounded; the actual rate used for this category was calculated to ensure that the sum total of population in fine zones equalled the control figure in table 11.2.

11.12 Analysis of the 1966 data showed that sex ratios in the fine zones varied only to a very small degree. Therefore a single ratio was used to give the zonal figures for male and female population in 1991.

The density of residential areas

11.13 The definition of assumed residential densities to be used in the preparation of an urban structure policy for Teesside has been made at a broad level of generalisation. The purpose of the exercise is to define densities that enable a proper examination of urban land use and transportation for a period of twenty-five years in the future. The assumed densities should be those that identify the likely maximum area of land required for new development, and a relatively high number of dwellings to be replaced on redeveloped sites. This situation will identify the greatest demands likely to be made on the transportation system in terms of the greatest traffic loading on the system in redevelopment areas, and the greatest extension of the system to serve areas of new development.

11.14 This is a different task from recommending densities actually to be used at the time of construction. These recommended densities should be derived from a detailed, short term analysis of the future demand for dwellings in different density ranges and from local, site planning considerations. It is enough for urban structure policy that the assumed densities give sufficient flexibility to the recommended urban structure to permit a variety of actual densities to be used at the time of development.

11.15 Density is frequently measured in terms of persons per net residential acre, where the area of land includes houses and gardens, development roads and incidental open spaces in residential areas. This is a precise measure, suitable for use in the design of residential areas. It is less suitable for preparing a long term urban structure plan. The variation in the forecast population of Teesside in 1991 was given in chapter 1. But because this variation was the result of uncertainty about future fertility rates, the variation in the forecast number of households was proportionately much less. Thus the number of dwellings needed on Teesside in 1991 is a more reliable forecast than the total population.

11.16 In addition, the previous section showed that the occupancy rate of a dwelling in 1991 will depend to a considerable extent on the date of its construction and whether it is a local authority or a private dwelling. Thus the number of dwellings to be built in an area can be determined but the population living in that area can only be roughly forecast for a period of this length. For these two reasons, the assumed densities used in the urban structure planning are expressed in terms of dwellings per net residential acre.

Net residential densities, 1966

11.17 The geographical pattern of density is illustrated in figure 11.2. It shows that much of Teesside is developed at a low density, as is shown in table 11.5. The mean density per fine zone was about 49 persons per net residential acre, though the median zonal value was only about 39 persons because of the large number of suburban and semi-rural zones.

11.18 The mean values mask a very wide range of densities. About 60 per cent of all dwellings on Teesside are in areas with a density of less than 13 dwellings per acre. Most of these dwellings date from the period

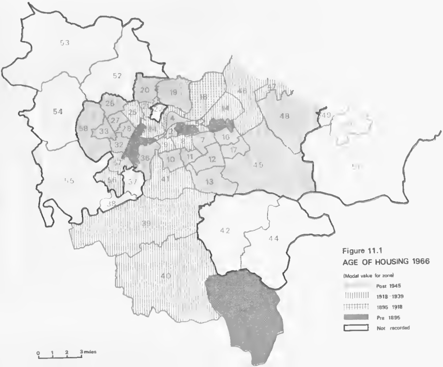


Figure 11.1
AGE OF HOUSING 1966

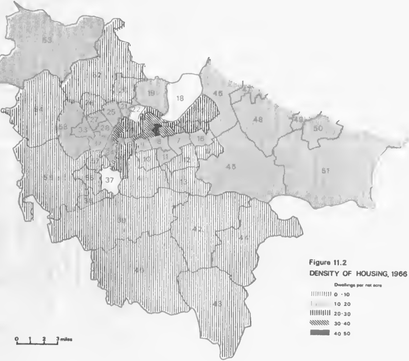


Figure 11.2
DENSITY OF HOUSING, 1966

Table 11.5. Distribution of net residential densities, Teesside, 1966

persons per acre	dwellings per acre	percentage of fine zones	percentage of dwellings
0–32	0–9	38	41
33–42	10–12	16	19
43–64	13–20	24	19
65–96	21–30	11	8
over 96	over 30	11	13
TOTAL		100	100

Source: Home Interview and Land Use Surveys, fine zone data.

since 1930 and are of a reasonable standard, as was shown by the survey of housing and environmental deficiency in chapter 9. Since 1945, most private development has been built at a net density of about 10 dwellings per acre, but local authority development has been at an average of 13 dwellings per acre. Most of these have been standard family dwellings, but there has been a small number of 4-storey maisonettes and high-rise flats built in the local authority sector.

11.19 At the other extreme, 13 per cent of the dwellings are in areas where the net density is more than 96 persons, or 30 dwellings per acre. These are nearly all in the older parts of Teesside, bye-law terrace houses where the interior space and the provision of exterior space, including that for parking and play areas, are equally deficient. These are the areas of housing identified for urgent action in the survey of housing and environmental deficiency. The relationship between density and age of dwelling is even more directly illustrated by comparing the average density in zones of different modal ages (see table 11.6).

Table 11.6. Net residential density, by date of construction, Teesside (dwellings per acre)

pre-1895	33.0
1895–1914	25.0
1919–1939	12.5
post-1945	11.5

Source: Land Use Survey, fine zone data

Density for existing residential areas

11.20 These residential areas are of two types:

a the oldest residential areas, near the existing urban centres and in the older industrial areas, containing about 58,000 dwellings;

b the newer residential areas, mostly built since 1930 and containing about 87,000 dwellings.

11.21 The latter category is likely to remain unchanged for the next twenty-five years and it is therefore unnecessary to make any assumptions about net densities for these areas. The former category, however, is seriously in need of redevelopment or rehabilitation as was shown in chapter 9. Assumed densities have to be defined for these areas as part of urban structure planning.

11.22 The assumed densities for these areas were set out in table 9.7. They ranged from 13 dwellings per acre in the outer suburbs, to 40 dwellings per acre in the central urban areas. The assumed densities were required for two purposes. The first was to estimate the amount of overspill likely from areas of rehabilitation where clearance would be necessary to give a reasonable environment, including adequate provision of open spaces and off-street car parking, but in which the basic form of the development would remain unchanged. The two pilot studies described in Volume I, chapter 12, showed that the assumed ceiling densities did give an effective means of estimating the likely amount of overspill from these areas.

11.23 The second purpose was to estimate the maximum number of dwellings to be replaced in areas of cleared housing which were suitable for residential redevelopment. In fact, only about 150 acres were suitable for such redevelopment located mainly in the vicinity of Middlesbrough and Stockton central areas. Dwellings in this type of location could reasonably include a proportion of high density, including high-rise development. They would be suitable for smaller dwellings for single persons and for the rehousing of the relatively small families now living in these areas. The assumed densities are relatively high, at 30 and 40 dwellings per acre (that is, over 96 persons per acre), in order that the maximum likely amount of replacement can be estimated. More careful, detailed study would be needed before actual densities were selected for particular areas. But a detailed study of the redevelopment area at Parkfield, Stockton, shows that a density of 90 persons per acre could be achieved in the form of low-rise housing with some 3-storey dwellings.

11.24 However, the assumed ceiling densities in table 9.7 give a means for forecasting the likely maximum amount of overspill from the rehabilitation areas, and the maximum number of dwellings that could be replaced in clearance areas. They thus give the maximum flexibility for the actual densities and forms of development for these areas.

Density for new residential areas

11.25 About 104,000 dwellings will have to be built in new residential areas between 1966 and 1991. Analysis of the likely increase in family incomes and housing trends suggests that a considerable proportion of these dwellings are likely to be 'family' dwellings in owner-occupation; that they will be designed to give more generous standards of internal and external space; and that, in particular, the layout of the housing areas will have to provide for a high level of car ownership. These trends point clearly to a continued use of relatively low densities.

11.26 However, there is likely to be an increase in the proportion of small households, including single young people and old persons, for both of whom small dwellings are likely to be needed with only a minimum amount of external space for private gardens. However, it is probable that only a small proportion of the demand for small dwellings will be met in high-rise, high density development. There is no significant shortage of land on Teesside and land prices are relatively low. High-rise development is expensive, is not suited to the needs of families or old persons, nor is it suited to owner-occupation. It is not likely to be attractive on a large scale either to the local authority or to the private sector. Therefore, the increase in the number of smaller dwellings is likely to take the form of low-rise development, probably at higher net densities than has been the case in recent development.

11.27 In deriving a general assumed density (see table 11.7), a balance has to be struck between a possible increase in densities due to the construction of a larger proportion of smaller dwellings and the likely lowering of densities for family dwellings. In view of the uncertainties in forecasting both these types of demand, the maximum flexibility in accommodating both types is given by assuming a continuance of the

Table 11.7. Assumed net residential densities, new development, Teesside, 1966–91

	persons per acre	dwellings per acre
local authority	40–45	12.0
private	27–30	9.0
all dwellings	30–40	10.5

Note: persons per acre calculated at appropriate occupancy rates, table 11.4.

trend towards lower densities found in recent development.

11.28 It must be stressed that these assumed densities are for the purpose of defining large areas of land required for residential development and the appropriate requirements for the transportation system. Within these areas, actual net densities would vary considerably, depending on the dwelling types, their location in relation to district centres, open spaces and public transport systems; and site planning considerations.

Residential land

11.29 A housing balance sheet for the period 1966–91 was prepared in chapter 10 showing that land would be required for about 103,800 dwellings including about 17,600 dwellings for the assumed migration of population and a further 27,800 for the replacement of cleared dwellings. The assumed ceiling densities for cleared sites suitable for redevelopment show that 4,500 dwellings could be built on these sites. Thus undeveloped land will be required for about 99,300 dwellings. This is the equivalent of a net residential requirement of nearly 9,000 acres which will be in two categories:

a committed land, that is specific undeveloped sites which are to be developed as a consequence of current planning policies and intentions;

b additional land whose development is recommended in this report.

Committed residential land

11.30 Committed residential land is that which had not been developed by September 1966 but which was likely to be developed for housing for one or more of the following reasons:

a sites allocated on a town map approved by the Ministry of Housing and Local Government, or which have been approved by the Ministry as an amendment to a town map, or which have been submitted for approval to the Ministry as an amendment to a town map;

b sites which the local planning authority has resolved to allocate for housing at the next review of a town map, or which are shown on a village plan approved by the authority;

c sites allocated on a draft town map but which had not necessarily yet been approved by the local planning authority;

d sites subject to such intense pressure for development because of their location and ownership, that the local planning authority is likely to approve their development.

11.31 The degree of commitment therefore varies considerably but land is included only if it is considered that development is very likely and desirable within the period to 1981. The firmest commitments include sites where development (e.g. site works, provision of services) had already started by September 1966, or where detailed planning permission for development had been granted. The least firm commitments include categories (c) and (d).

11.32 The sources of data were as follows:

a a comparison between approved town maps and amendments to town maps and the Land Use Survey;

b informal meetings with officers of local planning authorities and an examination of planning decisions.

11.33 The estimated number of dwellings to be built on each site was taken from the detailed application for planning permission where this existed. For most of the sites, however, an estimate had to be made within the range of the assumed densities for new development described in the previous section, modified on the basis of advice from the local authority offices; and from knowledge of the probable developer, the likely form of development and other local and site planning factors.

11.34 The full results of this analysis are given in table 11.8, by local authority area, and the relative strength of the commitment in the different sectors is given in table 11.9. Geographically, the commitment for new housing is spread fairly evenly around the periphery of the existing built-up area but with a major concentration south of Middlesbrough in an east–west strip from Eston to Hemlington; and with a second concentration along the coast from Redcar to Saltburn (see figure 11.3).

11.35 The implications of this state of commitment is discussed in chapter 10 in terms of the effective supply

Table 11.8. Committed residential development, Teesside, September 1966 (numbers of dwellings)

local authority	local authority development	private development	developer unknown	total
Middlesbrough C.B.	260	1,200	0	1,460
North Riding A.C.:				
Eston U.D.	2,570	1,320	460	4,350
Guisborough U.D.	420	2,780	170	3,370
Loftus U.D.	0	0	1,300	1,300
Redcar M.B.	2,070	1,180	1,000	4,260
Saltburn and Marske U.D.	200	1,260	2,560	4,020
Skelton and Brotton U.D.	230	300	1,310	1,840
Thornaby M.B.	1,050	1,130	720	2,910
Stokesley R.D.	6,020	9,900	330	16,250
Durham A.C.:				
Billingham U.D.	560	1,090	1,340	2,990
Sedgefield R.D. (part)	0	0	600	600
Stockton M.B.	500	2,070	0	2,570
Stockton R.D. (part)	1,530	3,190	120	4,840
TOTAL	15,410	25,430	9,910	50,750

Source: local authority records.

Table 11.9. Degree of commitment for development, Teesside, September 1966 (numbers of dwellings)

	local authority development	private development	developer unknown	total
sites with planning permission	9,260	20,990	0	30,250
sites without planning permission but on an approved town map or plan	2,400	2,980	2,960	8 340
other sites	3,750	1,460	6,950	12,150
TOTAL	15,410	25,430	9,910	50,750

Source local authority records.

of building land. To some extent, the position for the private developer is more favourable than table 11.9 suggests. Much of the land for which the likely developer is not yet known is located on the coast and will almost certainly be developed by private developers. But the incipient shortage of land in the local authority sector is more serious, for the reasons set out in chapter 10.

Additional residential land

11.36 The requirement of additional residential land can thus be set out as follows:

new dwellings to be provided 1966–91,	103,760
less dwellings on redevelopment sites,	4,570
less dwellings on committed sites,	50,750
therefore, dwellings on additional land	48,440

The distribution of the land for this development, amounting to about 4,300 acres for net residential uses, is described in Volume I, chapter 8, together with the reasons for its selection.

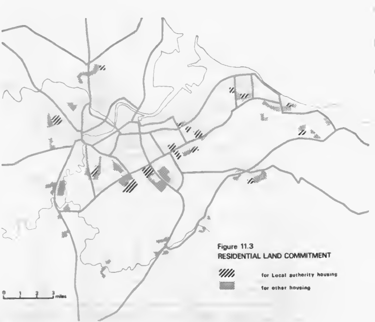


Figure 11.3
RESIDENTIAL LAND COMMITMENT

▨ for Local authority housing

▒ for other housing

12 Accessibility and residential environment

Residential environment and accessibility to work

12.1 An account is given in this chapter of investigations into methods for the analysis and evaluation of planning strategies by considering and relating concepts of work accessibility and residential desirability.

Job opportunity

12.2 Accessibility between places of work and places of residence is one of the many factors which matter to people living in an urban area such as Teesside. It might be taken into account in various ways when preparing urban structure policy or when comparing alternative policies, though it will be easier to do so if accessibility can be measured in some way. The difficulty is that it is not possible to say precisely how people value ease of access to a choice of jobs, or a reduction in the journey to work. There are also problems associated with, say, highly skilled people for whom the effective choice of jobs is small, and with the fact that high accessibility to work may mean low accessibility to other activities.

12.3 One way of devising a measure of accessibility is to argue that in an existing and established area the various forces of urban and social change have resulted in a series of community and personal decisions which in turn have produced a pattern of journey to work movements which do not necessarily represent any optimum situation but do reflect the relative importances which people attach (on average) to numbers of jobs and to different distances.

12.4 If this is accepted, the existing pattern can be used to measure the (local) parameters in a mathematical model, and so to produce a single numerical value which describes the level of accessibility which may be associated with the town. If the town is then to be extended in some way, then the same parameters may reasonably be used to obtain a measure of the new level of accessibility. It will show whether, on average, the altered distribution of houses and jobs has improved or worsened accessibility to work as defined in the model. Consequently, it may be used to compare different proposed extensions of a town.

12.5 However, it must be realised that the parameters for one town may be different from those in a totally different town where the kind of work, car ownership and many other matters may produce different attitudes to choice and travel.

12.6 It must also be realised that the indices of accessibility essentially are statistics associated with plans. If one plan gives a higher index value then another plan, it does not necessarily mean that the plan with the higher value is the better plan. Rather, it will be necessary to examine the plans to determine why the value of the index should be higher. The reason for this higher value will then be only one of many features to be taken into account in making a decision on which is the better plan. The index is no more then a statistic which summarises a great deal of unwieldy data.

12.7 The measure of accessibility to work described in this chapter is defined as the number of jobs theoretically available to the population actually seeking work. The term 'job opportunity' was used to describe this concept in Volume I, so as to avoid confusion with the other measure of accessibility referred to in Volume I, chapter 5, that related to the relative accessibility by public and private transport. An index of job opportunity is measured for each of the zones into which Teesside is divided for statistical purposes; and the weighted average of these zonal indices gives an index for Teesside as a whole.

12.8 The principle behind this concept is that the greater the number of jobs theoretically available to the residents of a zone, the wider will be their choice of work. All other things being equal, the most desirable strategy for land use planning will be that which gives the highest job opportunity.

12.9 But the job opportunity available to the residents of a zone is not the simple number of jobs in that zone. Rather, all jobs on Teesside are theoretically available to the residents of a particular zone, but their attractiveness is diminished the farther away the jobs are from that residential zone; or the more intense is the competition for any particular group of jobs from the residents of other zones.

12.10 Therefore, the index of job opportunity for each zone, and that for Teesside, was calculated by use of a mathematical model which takes into account these factors of distance and competition. The model, which is a modified form of the gravity models used in the analysis of retail sales and transportation systems, requires as data the population and employment in each zone and the full set of interzonal distances. The parameters in the model were derived from analysis of the 1966 data. Future values of the indices were calculated for each of the alternative strategies for the urban development of Teesside to 1991. These strategies were described in Volume I, chapter 4.

12.11 This stage of the work was reasonably successful in that use of the model gave the index of job opportunity for each strategy. The model showed that the value of the index would hardly change whichever strategy were finally selected. This was partly because the location of so much of the total population and employment of Teesside in 1991 can be predicted with confidence because of current commitments and planning policy, described in Volume I, chapter 3. This committed development, both residential and industrial, determines the main pattern and level of job opportunity for the next twenty-five years. A second reason for the small degree of variation in the indices was that the strategies all tended to be framed with reasonable job opportunity as one of their aims. The only strategy with an appreciably different index would be that for overspill development in the form of a satellite or new town. Even for a comparatively small town in a location as close as Stokesley, there would be an appreciable fall in the index of job opportunity.

12.12 Examination of the zonal indices in each of the alternative strategies proved useful, as it demonstrated important details about the effects of different strategies on particular parts of Teesside, such as East Cleveland. From this, clear indications were derived about ways of improving the pattern of job opportunity by the selection of particular locations for new employment or residential development.

12.13 Strictly, the analysis should have been extended by the use of the model to measure the job opportunity for particular groups of people, such as male and female workers, or blue-collar and white-collar workers. It was not possible in the time available, however, to derive values for the parameters in the model for the separate groups of workers. It is possible that these indices would be of greater significance than those for total employment. The subject is examined in a more empirical way in chapter 7 of this volume.

12.14 A simplified form of the model was used to measure accessibility to shopping. The model was calibrated and used to measure the zonal indices for 1966 and for the recommended urban structure policy for 1991, to provide data for the analysis of residential desirability referred to in the latter part of this chapter. But the full analysis of shopping relied on the methods described in chapter 14 of this volume.

Residential desirability

12.15 Following a detailed description of the work on job opportunity, the rest of this chapter contains an account of the mathematical investigation of residential desirability. To do this, multiple regression equations were derived of the form:

$$y = a_0 + a_1 x_1 + \ldots + a_n x_n,$$

where y was an index of residential desirability in a particular zone, and the x's were indices of different environmental characteristics in each zone. The final form of the equation would then give an indication of the relative importance of different environmental characteristics in explaining the distribution of the selected index of residential desirability. Explaining is used in the statistical sense, with no necessary implication that the particular environmental characteristics cause residential desirability, rather that they are to be found in joint association.

12.16 Clearly there are many different ideas of residential desirability, and an attempt was made to find a statistic which would to some extent reflect them. One thought likely to be useful was the gross rateable value per dwelling in each zone, a second was the average family income in each zone, for those with higher incomes are more likely to live in desirable areas. This latter measure was used mainly with a view to predicting the future areal distribution of family incomes in a given urban strategy.

12.17 Independent variables were selected for initial inclusion in the multiple regression equation. The criteria for their selection were that they were measurable for 1966; that their values could be independently predicted for a given urban structure in 1991; and that they were not themselves strongly correlated. In all, eleven variables met these criteria. They were the average age and size of dwellings; net residential density; the proportion of industrial land in a zone; the altitude of a zone; its characteristic topography; the maturity of its landscape; the level of atmospheric pollution; proximity to landscape features; and the indices of job opportunity to work and to shopping.

12.18 In the event, it proved possible to establish by stepwise multiple regression which of these variables were statistically significant in explaining the distribution of residential desirability. For gross rateable value, the significant variables were the age and size of dwelling; altitude; and the level of atmospheric pollution. And for family incomes, the same four variables were significant, though the form of this equation was substantially different from that for gross rateable value.

12.19 The analysis contributed useful insights but neither equation was sufficiently reliable in the statistical sense to be used to compare the residential desirability of different strategies. The more reliable equation, that for family income, accounted for some 61 per cent of the variance in the distribution of incomes.

12.20 On the other hand, this equation for family incomes was sufficiently reliable to give a prediction of the average family income in each zone within the chosen urban strategy, for the purposes of forecasting future car ownership and retail sales. The process involved predicting for each zone, the likely average age and size of dwelling in 1991; and the likely incidence of atmospheric pollution. Those predictions are described in chapters 10 and 23. These new values were substituted in the regression equation, and a prediction obtained of the average family income in 1991 in each zone at 1966 prices and real incomes. The description of the results of this prediction is given in chapter 13 of this volume.

Job opportunity: the model and its calibration

Formulation of the model

12.21 Three fundamental assumptions form the basis of the general accessibility opportunity model, in which the opportunities may be jobs, or shops, or clubs.

a Looking at it simply from the point of the opportunity to do some specific action, residence in a given zone is more attractive to an individual if there are many relevant opportunities from which to choose. A man would prefer to be within reasonable access of, say, ten jobs, or clubs, or shops, than only two.

b An opportunity in the near vicinity, or within easy means of transport, means more than one far away. This means, in terms of jobs, that one would prefer a job in one's own zone of residence to an otherwise comparable job 10 miles away.

c The existence of a certain number of opportunities means less to a given individual as the number of people competing for those opportunities increases. In terms of jobs, this means that a small number of jobs in one's own zone of residence is less attractive to the average individual if a number of other people are competing for those same jobs.

12.22 Suppose that in zone i there are O_i opportunities, and N_i residents who wish to take advantage of opportunities. Let the mean distance which individuals residing in zone i have to travel in order to take advantage of opportunities in that zone be D_{ii}. Let the mean distance from place of residence in zone i to place of opportunity in zone j be D_{ij}.

12.23 For a resident of zone i the following opportunities are available:

O_i in zone i, for which people in all zones compete,
O_j in zone j, for which people in all zones compete,
etc.

12.24 If competition is ignored, it may be said that the O_i opportunities at a mean distance of O_{ii} present an 'attraction' to a single resident of zone i of

$$\frac{O_i^{\beta}}{D_{ii}^{\alpha}}$$

where α, β are numerical exponents indicating that a doubling of opportunities (or halving of distance) implies an increase of attractiveness but not necessarily an exact doubling of it.

12.25 Likewise ignoring competition, the attractiveness to a resident of zone i of O_j opportunities in zone j is given by

$$\frac{O_j^{\beta}}{D_{ij}^{\alpha}}$$

12.26 Assume that (a) everybody resident in zone i is an equal competitor with all other residents of that zone for opportunities, wherever they may be; (b) every person is a stronger competitor for jobs in his own zone than is the resident of any other zone. More precisely, the residents of zone j have an effective competitiveness for opportunities in zone i of

$$\left(\frac{O_{ii}}{O_{ij}}\right)^{\gamma}$$

where, once again, γ is an exponent intended to allow for the fact that a person living twice as far away need not be simply a half-effective competitor.

12.27 The total 'effective' competition for the O_i opportunities in zone i will therefore be

$$C_i = \left[N_i + N_j\left(\frac{O_{ii}}{O_{ij}}\right)^{\gamma} + N_k\left(\frac{D_{ii}}{D_{ik}}\right)^{\gamma} + \ldots\right]^{\delta}$$

which, remembering that $\frac{O_{ii}}{O_{ii}} = 1$, can be put as

$$C_i = \left[\sum_j N_j\left(\frac{D_{ii}}{O_{ij}}\right)^{\gamma}\right]^{\delta}, \text{ over all zones, including zone } i.$$

It represents the total competition from residents in all zones, the more distant residents being less effective competitors.

12.26 The net attractiveness of opportunities in zone i to a given resident of zone i may now be written as the crude value derived in paragraph 12.24 divided by the degree of competition. This gives

$$A_{ii} = \frac{O_i^{\beta}}{D_{ii}^{\alpha}\cdot C_i}$$

where C_i has the value of paragraph 12.27.

12.29 For opportunities in zone j residents of that zone are more effective competitors than are those of zone i. The degree of competition is, by analogy with paragraph 27, given by

$$C_i = \left[\sum_k N_k\left(\frac{D_{jj}}{O_{jk}}\right)^{\gamma}\right]^{\delta} \text{ over all zones.}$$

12.30 This leads to a measure of the attractiveness of opportunities in zone j to residents of zone i taking competition into account. It is

$$A_{ij} = \frac{O_j^{\beta}}{D_{ij}^{\alpha}\cdot C_j}.$$

12.31 Proceeding in this way, the attractiveness of residing in zone i because of the various opportunities in each zone can be obtained. The total attractiveness of residing in zone i from the point of a specific type of opportunity, is given by

$$\begin{aligned} A_i &= \sum_j A_{ij} \\ &= \sum_j \left(\frac{O_j^{\beta}}{O_{ij}^{\alpha}\cdot C_j}\right) \\ &= \sum_j \frac{\dfrac{O_j^{\beta}}{D_{ij}^{\alpha}}}{\left[\sum_k N_k\left(\dfrac{O_{jj}}{D_{kj}}\right)^{\gamma}\right]^{\delta}} \end{aligned}$$

12.32 This model can be illustrated by the following examples, assuming

$$\alpha, \beta, \gamma, \delta = 1.$$

Case A

Zone 1: $O_1 = 100$; $N_1 = 90$; $O_{11} = 1$.
Zone 2: $O_2 = 90$; $N_2 = 100$; $D_{22} = 1$.
$D_{12} = 3$

$$\begin{aligned} \text{For zone 1, } A &= \frac{100}{1} \div [90 + 100\cdot(\tfrac{1}{3})] \\ &\quad + \frac{90}{3} \div [90\cdot(\tfrac{1}{3}) + 100] \\ &= 1.042 \end{aligned}$$

$$\begin{aligned} \text{For zone 2, } A &= \frac{90}{1} \div [100 + 90\cdot(\tfrac{1}{3})] \\ &\quad + \frac{100}{3} \div [100\cdot(\tfrac{1}{3}) + 90] \\ &= 0.963 \end{aligned}$$

This gives the (sensible) result that zone 1 is more attractive than zone 2.

Case B

As in case A, but separate the zones further by writing $D_{12} = 6$.

The revised calculations give

$$\begin{aligned} \text{For zone 1, } A &= 100 \div [90 + 100\cdot(\tfrac{1}{6})] \\ &= \frac{90}{6} \div [90\cdot(\tfrac{1}{6}) + 100] \\ &= 1.063 \end{aligned}$$

$$\begin{aligned} \text{For zone 2, } A &= 90 \div [100 + 90\cdot(\tfrac{1}{6})] \\ &\quad + \frac{100}{6} \div [100\cdot(\tfrac{1}{6}) + 90] \\ &= 0.939 \end{aligned}$$

Again zone 1 is preferred to zone 2, but the ratio of the two values in Case A is lower than in Case 6, showing that the separation of the two zones by a greater amount makes zone 1 (with surplus opportunities) even more preferable to zone 2 (with surplus claimants) than previously.

12.33 Note, too, that zone 1 is absolutely more attractive in Case B than in Case A, while zone 2 is absolutely less attractive. This is because where there are surplus local opportunities, the shifting further away of a zone which has too few local opportunities not only reduces the value of the index by diminishing the total effective opportunities for zone 1 residents, but it also increases the value of the index by making the people of the other zone less powerful competitors than they were. The two forces work in opposite directions. For zone 2, however, the deficiency of local opportunities means that the combined effects of making zone 1 opportunities less attractive (because they are more distant) and of reducing the effectiveness of competition for zone 1 opportunities (for the same reason), work in the same direction and reduce the attractiveness of zone 2.

Calibration of the model

12.34 The introduction of exponents can, conceivably, alter the relative values of the index, and possibly even reverse the 'preferences'. This is why it is essential to take some pains over the calibration of the index.

12.35 A computer program was written to calibrate the accessibility opportunity model. As there was not time to calibrate the model exactly as described in paragraph 12.31, a simplifying assumption was made which keeps the spirit of the argument, but alters the detail. Instead of using the formula of paragraph 12.29 to define the degree of competition in zone j, the following formula was used:

$$C_j = \left[\sum_k \left(\frac{W_k}{D_{kj}{}^{\alpha}}\right)\right]^{\delta}$$

where $W_k = N_k \times$ activity rate. Essentially, this makes the competition proportional to the number of people who would be attracted to the zone according to the simple gravity model, in which competition is ignored. The procedure is thus reduced to estimating attractions according to the simple model, and then arguing that competition in each zone is proportional to these attractions, and so a more refined measure of attraction should take account of this by using these estimates as values of C_j in the formula of paragraph 12.30.

12.36 The amended form of the model is therefore

$$S_{ij} = K_i \cdot \frac{O_j{}^{\beta} \cdot P_j}{D_{ij}{}^{\alpha}} \qquad \text{(i)}$$

where

$P_j = 1$ for all values of j, the traditional gravity model (ii)

or

$P_j = \dfrac{1}{C_j}$, the accessibility opportunity model (iii)

where

S_{ij} = number of people travelling from residential zone i to attraction zone j

K_i = a constant for zone i

$$C_j = \left[\sum_k \left(\frac{W_k}{D_{kj}{}^{\alpha}}\right)\right]^{\delta}$$

$W_k = N_k \times$ activity rate.

12.37 Data were available from the Home Interview Survey in the form of a matrix of observed numbers of journeys (S_{ij}) and observed interzonal time distances, in minutes (O_{ij}).

12.38 Values of α, β in the gravity model (ii) were determined by considering the two matrices of data for each residential zone i separately, giving in effect α_i, β_i, $i = 1, \ldots, n$. α, β were obtained by averaging the α_i's and β_i's.

12.39 For instance, consider population zone 8. The equation

$$S_{8j} = K_8 \cdot \frac{D_j{}^{\beta_8}}{D_{8j}{}^{\alpha_8}} \qquad \text{(iv)}$$

has to be fitted to the n points

$$(S_{81}, O_1, D_{81}), (S_{82}, D_2, D_{82}), \ldots, (S_{8n}, O_n, D_{8n}).$$

Taking logs of (iv)

$$\log S_{8j} = \log K_8 + \beta_8 \log O_j - \alpha_8 \log D_{8j}$$

which is the form

$$y = A + Bx + B_1 x_1.$$

This is a linear equation which has to be fitted to the n points $(x_{11}, x_{21}, y_1), \ldots, (x_{1n}, x_{2n}, y_n)$, a standard problem in multiple regression.

Zones to which there were no trips from zone 8 were ignored in the calculations. This introduces a complication which is discussed in paragraph 12.48.

12.40 Having calculated α_i, β_i for each zone, a weighted average was calculated for each exponent, using the total number of trips reported from each zone, as follows:

$$\alpha = \frac{\sum \alpha_i \cdot w_i}{\sum w_i}$$

where w_i = weight given to zone i, proportional to the number of trips reported from i. The greater the number of trips, the more accurate will be the D_{ij}'s from that zone and hence the more accurate will be α_i. w_i is also proportional to the reciprocal of the variance of the α_i.

12.41 This completes the basic calculations for the traditional gravity model, containing no competition term, that is model (ii). But this calculation forms just one loop for the full accessibility opportunity model (iii).

12.42 Having obtained an initial value for α, the competition term may be calculated according to the formula

$$C_j = \left[\sum_k \left(\frac{W_k}{D_{kj}{}^{\alpha}}\right)\right]^{\delta},$$

assuming a value for δ as described in paragraph 12.47.

12.43 Equation (i) is then rearranged,

$$\frac{S_{ij}}{P_j} = K_i \cdot \frac{O_j{}^{\beta}}{D_{ij}{}^{\alpha}}$$

where $P_j = \dfrac{1}{C_j}$.

12.44 Taking logs,

$$\log\left(\frac{S_{ij}}{P_j}\right) = \log K_i + \beta \log O_j - \alpha \log D_{ij},$$

α and β can then be recalculated according to the same procedure as in paragraphs 12.39 and 12.40. With the new value of α, C_j can be recalculated and the loop repeated again. This procedure is continued until the proportional changes in α and β are both less than a preassigned quantity p.

12.45 The goodness of fit of the model is measured by the correlation between the observed travel volumes S_{ij} and the predicted travel volumes S'_{ij}.

Values of K_i are first calculated from the formula

$$\mathrm{P}_{j=1}^{n} \cdot S_{ij} = K_i{}^{n}\, \mathrm{P}_{j=1}^{n} \cdot \left(\frac{O_j{}^{\beta}}{D_{ij}{}^{\alpha}\; C_j}\right)$$

where P denotes product.

Values of S'_{ij} are calculated thus

$$S'_{ij} = K_i \cdot \frac{O_j{}^{\beta}}{D_{ij}{}^{\alpha} \cdot C_j}$$

12.46 The model for work accessibility opportunity was calibrated using the following data from the Home Interview Survey and other surveys. Exact details of the preparation of this data is given in other sections of the report.

n = 58, i.e. the 1966 coarse zone system was used;

N_i, population in zone i, from Home Interview Survey;

D_i, employment in zone *i*, from Employment and other surveys;
D_{ij}, activity rate, average value for Teesside interzonal travel time, in minutes, from Home Interview Survey;
S_{ij}, number of interzonal work trips, from Home Interview Survey.

Table 12.1. Values of exponents used in residential accessibility models

	gravity model (ii)	accessibility opportunity model (iii)	
δ, exponent on competition	–	1.0	0.9
α, exponent on distance	1.026	1.200	1.201
β, exponent on attraction	0.8975	0.9124	0.8963
correlation coefficient	+0.6594	+0.7215	+0.6980

12.47 The results are shown in table 12.1. Two different values of δ were used. The results for δ = 0.9 showed no improvement in the fit of the model over δ = 1.0 and were therefore not used. Ideally other values of δ should have been tried or a more elaborate calibration procedure used but time did not allow this. The calibrated model should therefore be regarded as an improvement on the gravity model, rather than as the best possible model.

12.48 These results have to be interpreted carefully. They show the correlation between the numbers of trips actually made between zones, and the numbers 'predicted' or 'explained' by the model, but they exclude pairs of zones between which there were no actual trips. The model would have predicted zero trips only if there had been either no jobs or no people in one of the zones. This not entirely satisfactory step was taken because data was not available at the time about the values of D_{ij} where there were no recorded trips between any pair of zones. Since then the operation has been repeated, using all 3,132 pairs of zones and using geographic distance, for which all D_{ij}'s were available. The results indicate that the exclusion of the zero trips in this procedure has very probably not led to false conclusions.

12.49 The model for shop accessibility was calibrated using the following data:

$n = 58$, coarse zones;
N_i, population in zone *i*;
O_i, estimated annual retail sales in zone *i*, Durable Goods only;
D_{ij}, interzonal travel time of all shopping journeys (including by walking), from Home Interview Survey;
S_{ij}, number of all interzonal shopping trips.

12.50 The shopping model used was the simple gravity model (ii). This was partly because competition from other shoppers was not considered to be such a deterrent to the attractiveness of the shopping centre, and partly because of time. The results were as follows:

α, exponent on distance	0.7460
β, exponent on attraction	0.3775
correlation coefficient	+0.6318

12.51 In fact, the low correlation coefficient, and the nature of the data used in the calibration, together meant that this shopping model was not used in subsequent analysis. The method actually used is described in chapter 14.

Analysis of job opportunity

12.52 The average *per capita* index of job opportunity was then calculated for a series of alternative strategies:

strategy	date	description
A (C)	1991	westwards to Darlington
B (D)	1991	south along the Leven Valley
C (E)	1991	dispersed settlement southwards
D (H)	1991	compact development
E (J)	1991	linear growth to Stokesley and Guisborough
F (K)	1991	north-west growth
G (M)	1991	a new town at Stokesley
N/1	1991	the provisional urban plan
N/3	1991	the recommended urban structure
X	1966	the existing situation

Note. the letters in brackets are those used in a technical memorandum to the Steering Committee, *A Provisional Urban Plan*, January 1967.

12.53 The planning situation for 1966 was described according to the fifty-eight coarse zones of the Home Interview Survey. Each of the alternative strategies for 1991 was described by a specific system of up to seventy zones. An additional four zones were used both for 1966 and 1991 to describe the areas with which there was an interregional travel to work with Teesside.

12.54 The following characteristics were used to describe each situation:

a *population:* this was the estimated figure for 1966, and the forecast figures for 1991. A note on the method of calculation is given in the notes to table 12.3;

b *employment:* the estimated figure for 1966 and the forecasts for 1991. See the notes to table 12.3;

c *activity rate:* this was the proportion of total employment to total resident population; a constant figure was used for each strategy, local variations being ignored. The following rates were used:

strategies	A–G	44.0 per cent
	N/1	45.7 per cent
	N/3	42.0 per cent
	X	45.7 per cent

The sequence of data processing meant that an estimated activity rate had to be used for strategies A to G as, at that time, the full analysis of activity rates had not been completed. The rate for N/1 was taken to be the same as that observed, by survey, for the 1966 situation. Finally, the rate for N/3 is the final, forecast rate.

d *interzonal distances* were taken from those calculated for the transportation evaluation of the alternative strategies. They are the distance between zone centroids, described by a system of coordinates, but modified in such a way as to measure distances across the river Tees only via a bridge for which the coordinates were given. The straight line distance between centroids was scaled up by a factor of 1.33 to give an estimated distance by road.

e *exponents* on distance and attraction were those calculated by the calibration procedure described above, namely,

exponent on distance,	α = 1.2000
exponent on attraction,	β = 0.9124
assumed exponent,	δ = 1.0000

12.55 A computer program (LEVIL) was then used to calculate

a the *per capita* work accessibility index for each zone;

b the average *per capita* work accessibility index for the whole strategy.

The program used the formula

$$A_i = \sum_j \left[\frac{O_j^{\beta}}{D_{ij}^{\alpha} \sum_k \left(\frac{N_k \cdot R}{D_{kj}} \right)} \right]^{\delta}$$

where

A_i = total accessibility opportunity index in zone

O_j = employment in zone j

N_k = population in zone k

R = activity rate

D_{ij} = interzonal distance

α, β, δ = exponents.

12.56 The final set of *per capita* indices are given in table 12.2, arranged in rank order. There are two dominating characteristics in this comparative evaluation. The first is the very narrow range of values for the different 1991 strategies and the second is that the accessibility index at the present time is greater than anything resulting from the alternative strategies for 1991. In brief, a seeming consequence of planning during the next twenty-five years is that people's opportunity for accessibility to a wide range and number of jobs will be reduced whatever planning policy is adopted.

Table 12.2. Evaluation of alternative strategies by accessibility index

strategy	accessibility index	ratio
X	11.9048	–
N/1	8.0298	102.5
E	7.9888	101.9
N/3	7.9201	101.1
A	7.8179	99.7
B	7.8148	99.7
C	7.7972	99.5
F	7.7911	99.4
D	7.7904	99.4
G	7.5872	96.8
average of 1991 strategies	7.8375	100.0

Notes: the actual indices are of the order 8.0298 × 10⁻⁷, but are expressed as 8.0298 for convenience as they are only a relative measure with no absolute meaning; the ratio is calculated for convenience in comparing the 1991 indices. It is the ratio of the index for a strategy to the average index for all nine strategies.

12.57 The root cause of the situation is the relative proportion of footloose population and employment for which locations had to be found in the various strategies. The stages in evaluation were carried out concurrently with the analysis of data from the Home Interview, Land Use and Employment Surveys and the continuous process of refining the forecasts of the total size and distribution of population and employment. Therefore, to some extent the successive stages in the evaluation were not fully comparable with each other, nor are they fully comparable with the final forecasts that are described elsewhere in Volume II. The figures used in the various stages of the evaluation are shown in table 12.3. It will be noted that the effects of more detailed analysis and more refined forecasts is to increase the amount of footloose population, and to decrease the amount of footloose employment.

12.58 The higher value of the index for 1966 than for the 1991 strategies is clearly a consequence of the relative degrees of dispersal that are possible for population and employment. In 1966, 86 per cent of employment on Teesside was located in the inner core. Although the proportion is expected to fall to 71 per cent by 1991, the absolute amount of employment is likely to increase. This forecast depends for its validity on the general forecast of the level of economic activity on Teesside: it is unlikely that land use planning or transportation policy could seriously affect these figures. They are a consequence of the inertia created by the capital investment that has been made recently in the industries and activities of the area.

12.59 In contrast, the proportion of population in the inner core is likely to fall from 74 per cent in 1966 to

Table 12.3. Data used in the evaluation of alternative strategies

	inner core	peripheral area		survey area
		existing and committed	footloose	
population				
situation X, 1966	355,600	123,300	0	478,900
strategies A–G, 1991	323,400	260,600	116,000	700,000
strategy N/1, 1991	309,160	276,800	114,000	700,000
strategy N/3, 1991	281,100	252,900	180,000	704,000
employment				
situation X, 1966	170,700	28,000	0	198,700
strategies A–G, 1991	192,000	52,000	54,000	298,000
strategy N/1, 1991	224,400	57,600	38,000	320,000
strategy N/3, 1991	229,100	46,900	40,000	316,000

Notes: 1. inner core: the existing built-up area of Billingham, Stockton, Thornaby, Middlesbrough, Eston and Redcar, that is coarse zones 1–9, 14–18, 19–32, 34–38, 46–47 in the Home Interview Survey;
peripheral areas: the remainder of the Teesside Survey Area.

2. existing development: broadly, the areas where no substantial change is expected in land use;
committed development: broadly, the areas where planning permission has been given for residential development, industrial estates such as at Thornaby have been started, or allocations have been made on approved town maps. The full extent of this commitment is analysed in chapters 7 and 11;
footloose development: the residual figures of population for which a location has to be found, the residual figures of manufacturing employment for which industrial estates have to be proposed, and the service employment which will be located in association with, and catering for the footloose residential population.

3. the figures for population were derived as follows:
situation X, 1966: the uncorrected figures from the Home Interview Survey, with an allowance for population not in private households;
strategies A–G, 1991: these are based on numbers of dwellings in particular zones, scaled up by an occupancy rate of 3.43 persons per dwelling. The figures for committed and footloose population are estimates derived from the analysis of commitment and the forecast of total demand for dwellings. The figure for existing population in the peripheral areas is a residual calculation;
strategy N/1, 1991: a revised figure based on the final estimated distribution of dwellings using a constant occupancy rate of 3.43 persons per dwelling;
strategy N/3, 1991: this is calculated in the same way as for N/1, except that (i) a variable occupancy rate was used, varying from 2.9 persons per dwelling in stable zones with no new development, to 3.4 persons per dwelling in zones of proposed new development, (ii) the total number of dwellings for which land has to be found (footloose category) was substantially revised following a final forecast of household formation, and (iii) a final estimate was made of the effects of redevelopment and rehabilitation of old housing areas in the inner core, and the consequent amount of overspill.

4. The figures for employment were derived as follows:
situation X, 1966: the first estimate of the distribution of employment, from various surveys; this was later revised in detail;
strategies A–G, 1991: the total employment was the first forecast. The changes in employment in the inner core are mainly the net result of the continued growth and decline of current activities. The footloose employment is an estimate of the additional manufacturing employment needed, and of service employment to serve the footloose population;
strategy N/1, 1991: this was based on a more accurate forecast of the existing and committed distribution of employment, on a high estimate of the likely net inward travel-to-work to Teesside from outside the Survey Area;
strategy N/3, 1991: this incorporates the final revision of the total employment and its distribution. The method of calculation for this table is similar to that for N/1.

about 40 per cent by 1991, and this will be accompanied by an absolute fall in the population in the inner core. This is a consequence of three separate factors.

a A large number of dwellings in the inner area should be cleared as a consequence of the programme for redevelopment and rehabilitation described in chapter 9. But only a few of these cleared dwellings should be replaced on site, either because their sites are likely to be needed for alternative, non-residential uses; or because the cleared sites would be environmentally unsuitable for redevelopment; or because the cleared sites are needed to improve the quality of the residential environment.

b Very little land remains available and suitable for residential development in the inner core and that is already committed for residential uses.

c The average occupancy rate in the core is likely to be low compared with that in the new residential areas outside the core (see chapter 11). However, this refinement was applied only in the forecast and evaluation of strategy N/3.

12.60 The effect of the first two factors is likely to be that shown in strategy N/3 (see table 12.4). In these circumstances, the much greater dispersal of the residential population, compared with that of employment, is bound to lead to a general increase in the length of journeys to work, and will also lead to a general fall in work accessibility opportunity.

Table 12.4. Number of dwellings in the inner core and peripheral areas, strategy N/3

	inner core	peripheral areas
number of dwellings, 1966	100,100	44,830
clearances, 1966–91	25,940	1,630
replacement, 1966–91	4,470	90
committed, 1966–91	13,370	37,330
footloose, 1966–91	0	49,280
number of dwellings, 1991	91,990	129,710

12.61 The other main characteristic was the comparatively small range of variation in the indices of accessibility opportunity for the different 1991 strategies. It can be seen that because of the weight of commitment in strategy N/3 the distribution of about 77 per cent of the future population, and 86 per cent of the future employment, is known and is unlikely to vary because of land use planning policy. And the distribution of the footloose employment in each of the strategies was closely related to the selection of new housing areas. In these circumstances, the opportunity for introducing a planning policy which would lead to a significant change in job opportunity is strictly limited.

12.62 The distribution of indices of job opportunity for strategy N/3 is shown in figure 12.1. The common characteristic of all nine strategies is a belt of high indices along both sides of the river Tees between Stockton and the sea. The difference between each strategy lies in the peripheral areas where the introduction of a dominant direction for new settlement leads to an extension of the area of relatively high job opportunity. But, for the most part, this extension of accessibility is caused by the service employment associated with housing areas. It is not an intrinsic feature of the strategy.

12.63 There are, however, certain indications for planning policy to be drawn from the comparison of accessibility in the different strategies. The first seven strategies, A to G, were strictly comparable in their basic assumptions concerning the total, and the amount, of committed population and employment. They each assumed, too, that the central areas of Stockton and Middlesbrough would continue to serve Teesside as centres of equal status. The only variations between strategies were in the locations chosen for footloose development. In these circumstances, only two strategies differed from the general level of accessibility, namely, strategy E, which included a linear extension of development from Nunthorpe to Stokesley, and strategy G, which included a proposal for satellite development at Stokesley, physically separated from the rest of Teesside. The population and employment forecast for parts of these strategies in 1991, compared with that, say, for strategy D is shown in table 12.5.

Table 12.5. Population and employment, south-east Teesside, 1991

	population	employment
Stokesley and Great Ayton		
strategy D	11,800	1,800
strategy E	65,200	23,200
strategy G	72,600	30,100
Nunthorpe and Marton		
strategy D	103,200	32,500
strategy E	80,700	27,800
strategy G	47,000	8,500
East Cleveland and Guisborough		
strategy D	80,100	18,900
strategy E	82,600	17,600
strategy G	94,500	22,600

12.64 The index of job opportunity for strategy G was comparatively low mainly because the satellite, and the additional development at Guisborough, were both separated from Teesside. But the development at Stokesley in strategy E was linked to Teesside by development, including housing and employment, at Nunthorpe and Marton, sufficient to set up a relatively high index of job opportunity in this area.

12.65 Conversely, the index of job opportunity for strategy E was higher than that for strategy D because of the relative situations of development at Nunthorpe–Marton and at Guisborough and East Cleveland in the two strategies. There were 28 per cent more people, but only 17 per cent more jobs, at Nunthorpe–Marton in strategy D compared with strategy E. This was sufficient to make Nunthorpe–Marton a relatively attractive employment area for people living in East Cleveland, thus raising the values of indices in East Cleveland in strategy E.

12.66 Job opportunity indices were generally high along the river Tees upstream from Stockton whichever strategy was examined because of the strength of the commitment for growth in employment at Eaglescliffe and Thornaby.

12.67 Strategy N/1, however, introduced several new factors into planning policy. The most important was the recognition that the central area at Middlesbrough should be encouraged to grow into a dominant, regional centre for Teesside. If this policy were successful, then the level of employment in north Middlesbrough would be about 50,000 compared with about 32,000 in, say, strategy D. This increase would be the result of many activities being attracted to the regional centre that might otherwise be dispersed. The creation of this substantial concentration of employment is probably the main factor leading to the comparatively high index of accessibility in strategy N/1 compared with that in earlier strategies.

12.68 Finally, in strategy N/3, full recognition was given to the relatively good job opportunity south-west

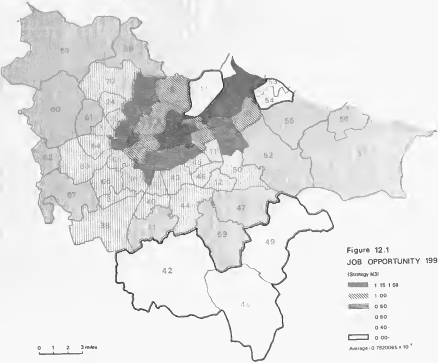


Figure 12.1

JOB OPPORTUNITY 1991

of Thornaby by locating major new housing development in close proximity to the industrial areas of Eaglescliffe and Thornaby. The distribution of population and employment at Eaglescliffe, Yarm, Ingleby Barwick and Castle Levington (including Thornaby industrial estate) is given in table 12.6. This would have raised the index of job opportunity probably to a higher level than in strategy N/1. But the effects of redistributing the location of new dwellings were offset by two other new features introduced into strategy N/3. The first was a revision of the number of dwellings required by 1991, an increase of about 12,000. The second was a revision of occupancy rates; instead of using an average rate for all dwellings, different rates were used for new and for old dwellings. The result of these two factors was that population in the new housing areas was increased, and that in the old area was decreased. This inevitably leads to a lower index of job opportunity because of the greater dispersal of population.

Table 12.6. Population and employment, Levenside, 1991

		population	employment
strategy	D	41,200	40,600
	N/1	50,300	36,200
	N/3	108,100	42,300

Analysis of residential desirability

Factors in the analysis of residential desirability

12.69 The formulation and calibration of a model to give an index of accessibility to work and to shopping for each residential zone on Teesside has been described. A second model was derived to indicate the importance of different factors contributing to the relative desirability of different residential areas. The model is in the form of a multiple regression equation in which the dependent variable was a measure of residential desirability and the independent variables were various measures of environmental character, and indices of accessibility.

12.70 Two alternative measures of residential desirability were used. The first was the average gross rateable value per room in each of the 211 fine zones of Teesside. Gross Rateable Value is based on the rent at which a hereditament may reasonably be expected to let to a hypothetical tenant on a year to year tenancy with the tenant paying the rates and tenants' taxes and the landlord being responsible for repairs, insurance and any other payments necessary to maintain that rent. The gross rateable values of those dwellings which were visited in the Home Interview Survey were taken from rating registers of local authorities, which were based on the 1963 re-valuation; and the value per room was calculated using the average number of rooms per dwelling from the Home Interview Survey.

12.71 The second measure of residential desirability was average weekly family income per zone, taken from the Home Interview Survey. This was analysed, partly as an alternative measure of desirability but mainly to provide, if possible, a method of predicting the future distribution of family incomes. That is, if the values of the independent variables in a future planning strategy could be forecast, it might prove possible to predict the future distribution of family incomes. The discussion of present and future family incomes is given in chapter 13; this chapter is confined to the use of family incomes in the model.

12.72 Four criteria were used in selecting the independent variables in the equation. The variables had to be capable of being measured for 1966, and independently predicted for a given urban structure in 1991. The variables should not themselves be strongly correlated. And there should be some basis for assuming that each variable was related to the measure of residential desirability.

12.73 The following eleven independent variables were finally selected to describe each zone.

x_1, modal age of dwelling, from the Land Use Survey:

	value
less than 20 years	0
20–50 years	1
50–70 years	2
more than 70 years	3

x_2, incidence of atmospheric pollution, from the Land Use Survey:

	initial value	transformed value
negligible pollution	0	0
light pollution	1	1
heavy pollution	2	4

x_3, net residential density, in dwellings per 100 square metres, from the Land Use Survey.

x_4, percentage of area of zone in industrial land use, from the Land Use Survey.

x_5, average altitude of zone, from Ordnance Survey maps:

	value
less than 100 feet O.D.	0.0
100–300 feet O.D.	2.0
301–400 feet O.D.	1.5
401–600 feet O.D.	1.0
over 600 feet O.D.	0.0

x_6, average maturity of landscape in each zone, urban areas from the Land Use Survey; rural areas from Ordnance Survey maps and air photographs:

	value
urban areas, no tree cover or gardens	0
urban areas, poor or immature landscape	1
urban areas, large trees and gardens	2
rural areas, poor tree cover, less than 2 per cent of area of zone, excluding hedgerows	2
rural areas, moderate tree cover, between 2 per cent and 5 per cent of area of zone	3
rural areas, trees cover more than 5 per cent of area of zone	4

x_7, character of topography of zone, from Ordnance Survey maps:

	value
flat, less than 30 per cent of area of zone with slopes more than 1/80	0
sloping, more than 30 per cent of area with slopes more than 1/80, and less than 5 per cent of area with slopes of more than 1/20	1
sloping, 5–20 per cent of area with slopes of more than 1/20	2
marked slopes, more than 20 per cent of area with slopes of more than 1/20	3

x_8, access to landscape features, from field surveys:

	initial value	transformed value
no views, and no attractive features within 15 minutes walk	0	0

good views, but no attractive features within 15 minutes walk	1	1
poor views, but attractive features within 15 minutes walk	2	1
good views, and attractive features within 15 minutes walk	3	3

x_9, index of shopping accessibility, from accessibility model.

x_{10}, index of accessibility to job opportunities, from accessibility model.

x_{11}, average number of habitable rooms per dwelling, from the Home Interview Survey.

12.74 The first problem, for both gross rateable value and for family income, was that many of the variables, including both alternative dependent variables, were taken from the Home Interview Survey which was a sample of approximately one in fifteen of the dwellings on Teesside. Thus, for many zones, the size of sample was too small for the data to be reliable. This problem was intensified as the response to the questions in the survey about income was lower then for the rest of the survey. For this reason, data from only 105 urban zones were used. All the rural zones, and the smaller urban zones were excluded.

Distribution of gross rateable value

12.75 The extent to which these variables can explain gross rateable value and family income was analysed by using a standard multiple regression program devised by C.E.I.R. Ltd. This was a stepwise multiple regression program used to establish the value of the coefficients of each variable in the equation, and to show which variables were statistically significant. For gross rateable value, the final regression equation was

$$\begin{aligned} y = 23.669 &- \underset{(0.348)}{1.035x_2} + \underset{(0.817)}{1.822x_5} - \underset{(0.091)}{0.557(x_1 \cdot x_{11})} \end{aligned}$$

where y is average gross rateable value per room
x_2 is atmospheric pollution
x_5 is altitude
x_1 is model age of dwelling
x_{11} is average number of rooms per dwelling
figures in brackets are the standard errors of the coefficients

correlation coefficient, $r = +0.6746$
$r^2 = 0.4550$

12.76 The transformed values for atmospheric pollution (x_2) and access to landscape features (x_8) were substituted for the initial values when it became clear after an initial regression analysis that the new values were a more correct indication of the effect of these factors on residential desirability. In addition, three transformed variables were used in the final analysis, namely, $(x_1)^2$, $(x_{11})^2$ and $(x_1 \cdot x_{11})$, though only the last of these proved to be statistically significant for explaining the distribution of gross rateable value.

12.77 This equation explains 45.5 per cent of the variance in the zonal values of average gross rateable value per room. The equation shows that the zones with low values will be those with heavy atmospheric pollution; located in the low lying, riverside areas below the 100 foot contour, or in the hills above 600 feet, and containing older, larger dwellings. Conversely, the highest values, the most desirable residential areas, will be those zones which lie between 100 feet and 300 feet above sea-level, suffer negligible atmospheric pollution and contain the newest dwellings or, if they are older, the smaller dwellings.

12.78 The other variables initially entering the regression equation proved not to be statistically significant. That is, the value of the coefficient of a variable such as the average maturity of landscape was smaller than the standard error in that coefficient.

12.79 It had been hoped that if the final equation were sufficiently reliable, that is, if sufficient of the variation in zonal values had been explained by the equation, then it could have been used in the process of evaluating alternative planning strategies. If values of the relevant independent variables were predicted for a given planning strategy, then it would be possible to predict the average gross rateable value per room for each zone in the strategy and, thence, to predict the total gross rateable value associated with that strategy, by multiplying the average value per room by the number of rooms. However, it was considered not worth pursuing this line of thought because of the low correlation coefficient between the predicted and the actual values in 1966, and the amount of variance in the zonal values of gross rateable value per room that was actually explained by the equation.

Distribution of family incomes

12.80 A similar form of equation was derived from the data for 1966 for average family income per zone. It was:

$$\begin{aligned} y = 11.942 &+ \underset{(2.740)}{7.249x_1} - \underset{(0.288)}{0.630x_2} + \underset{(0.590)}{2.547x_5} \\ &+ \underset{(0.112)}{0.482(x_{11})^2} - \underset{(0.843)}{2.081(x_1 \cdot x_{11})} \end{aligned}$$

where y is average weekly family income
x_1 is model age of dwelling
x_2 is level of atmospheric pollution
x_5 is altitude of zone
x_{11} is average number of rooms per dwelling
the figures in brackets are the standard errors of the coefficients

correlation coefficient, $r = +0.7123$
$r^2 = 0.5074$

and for an average zone the standard error of the estimate of $y = \pm$ £0.20, arithmetic mean of $y =$ £19.09, standard deviation of $y = \pm$£4.22.

12.81 The equation shows that family income is likely to be highest in those zones where atmospheric pollution is low, located in the belt between the 100 foot and 300 foot contours, and where the dwellings are new and of larger size. Conversely, zones where family income is likely to be low are those with old, large dwellings in areas of heavy atmospheric pollution, in the low lying, or the highest parts of Teesside.

12.82 Once again, the other variables were statistically not significant in explaining the variance in the zonal distribution of family incomes. However, the standard error of estimate was small, such that the equation could be used to predict the likely family income of an average zone with a margin of error of £0.4 at a 95 per cent level of confidence. In these circumstances, it was reasonable to use the equation to predict the future distribution of family incomes associated with planning strategy N/3. To do this, the average age and size of dwelling, and the level of atmospheric pollution, were predicted for each of the 211 fine zones and substituted in the regression equation and the family income for each fine zone calculated.

12.83 The forecast showed that the average weekly family income likely to be associated with planning strategy N/3 would be £21.15 in 1991, at 1966 prices and real incomes, compared with a reported average income of £19.09 in 1966. In other words, the pattern of development in strategy N/3 is likely to be that associated with a significantly higher income than at the present time. The full description of this prediction of family incomes likely to be associated with strategy N/3 and its use in forecasting future patterns of income and expenditure is given in chapter 13.

III Central areas and institutions

13 Income and expenditure

13.1 This chapter contains a description of the forecasts of personal income and expenditure, and their geographical distribution within Teesside. The purpose of the forecasts is, mainly, to provide a quantitative basis for defining a policy for the size and location of shopping facilities to be provided on Teesside. It will also give a basis for forecasting future levels of car ownership and the demand for facilities for recreation and other activities. It must be stressed that forecasts of levels of income and expenditure for a period of twenty-five years are necessarily very rough. Their object is to indicate the minimum likely scale of future growth, rather than to give a precise forecast.

13.2 The first step is to forecast future levels of personal income on Teesside. Two main sources of data have been used: the annual Family Expenditure Survey by the Ministry of Labour; and the annual and quinquennial reports of the Commissioners for Inland Revenue. In both of these sources, statistics are for the country as a whole and for the standard regions, including the Northern Region. Data were obtained from the Home Interview Survey about family incomes on Teesside. As will be shown, they are not a fully reliable source of information on personal incomes. Evidence on retail expenditure from the Board of Trade's Census of Distribution suggests that levels of personal expenditure on Teesside are similar to those in the Northern Region. Therefore, it is assumed that forecasts of personal incomes for the Northern Region can be taken as indicating future levels on Teesside.

13.3 The second step is to forecast future levels and patterns of personal expenditure on Teesside by applying forecasts of the proportion of personal income spent on different items to the forecasts of personal income. The analysis relies on the Family Expenditure Survey, and the Census of Distribution.

13.4 The third step is to analyse and forecast the future geographical pattern of personal incomes on Teesside, using the multiple regression equation based on Home Interview Survey data, described in chapter 12.

13.5 The fourth and final step is then to predict geographical variations in the distribution of personal expenditure on Teesside.

13.6 Unless otherwise stated, all money values in this chapter are expressed at price levels holding in December 1965.

Forecast of personal income

13.7 Average incomes per income earner (i.e. per person assessed for taxation) in the Northern Region were substantially lower than those for any other English standard region, being higher only than those for Wales, Scotland and Northern Ireland in 1959–60 (see table 13.1). The report for that year is the latest available giving regional data. The interpretation of data from this source needs care because of changes in definition, and the method of collecting the data (see J. Parry Lewis, Personal Income and Expenditure, in *The Welsh Economy*, edited by Brinley Thomas).

13.8 The explanation for this difference in levels of income lies in the contrast between the structure of income in the Northern Region and in the United Kingdom, as well as in the actual levels of income (see table 13.2). The first important feature is that the average

Table 13.1. Average income per income-earner, standard regions, 1959–60 (£ per annum, current prices)

United Kingdom	731.7
London and South East England	811.7
Midland	751.7
Southern	733.2
North Midland	718.1
Eastern	715.2
East and West Ridings	711.7
North West	708.6
South Western	690.6
Northern	689.8
Wales	677.8
Scotland	674.4
Northern Ireland	599.8

Source: Report of the Commissioners for Inland Revenue for 1959–60 (H.M.S.O., Cmnd. 1908).

Table 13.2. Composition of average income, 1959–60 (£ per annum, current prices)

	net income per earner		net income *per capita*	
main classes of income	UK	Northern Region Index (UK = 100)	UK	Northern Region Index (UK = 100)
wages	570	100.9	139.0	105.3
salaries	834	98.2	77.5	80.0
wife's earnings and family allowances	161	*	25.1	74.0
pensions	233	*	9.7	49.5
profits and professional earnings	742	102.5	22.7	89.5
net earned income	684	98.5	270.2	87.2
property (schedule A and B)	33	90.9	4.2	73.8
interest and dividends	296	70.3	22.3	54.8
net investment income	308	77.6	22.6	55.8
total net income	731	94.4	293.0	85.1

Source: Reports of the Commissioners for Inland Revenue.
Note: * data on number of tax cases not available.

Table 13.3. Average income per income-earner, 1949–60 (£ per annum, current prices)

	United Kingdom			Northern Region Index (UK = 100)		
main types of income	1949–50	1954–55	1959–60	1949–50	1954–55	1959–60
salaries, wages and other schedule E incomes	344	475	645	98.7	99.5	97.3
profits and professional earnings	595	669	742	95.4	105.0	102.6
income from property, schedule A and B	50	42	33	86.0	95.3	91.0
total net income	396	546	731	92.6	95.6	94.4

Source: Reports of the Commissioners for Inland Revenue.

levels of wages, profits and professional earnings per earner are higher in the Northern Region, and salaries per earner are only slightly lower than in the United Kingdom. As net earned income per earner in the Northern Region is only 96.5 per cent of the national level, it follows that average levels of wife's earnings and pensions are probably substantially lower. But the real cause for the comparatively low level of average incomes is the very low levels of income from property, interest and dividends.

13.9 A different, and substantially worse prospect is revealed if these figures are translated into average income *per capita*. The first important change is that average net income *per capita* in the Northern Region is only 85.1 per cent of national, compared with a figure of 94.4 per cent of national average income per income earner. Although the average salary earned by a salaried employee in the north is roughly the same as for his colleagues in the country, the proportion of salary earners in the region is much lower than in the country. Exactly the same applies, to a greater or lesser degree, with income from profits and professional earnings and all forms of investment income.

13.10 During the 1950's, incomes in the Northern Region tended to increase slightly faster than in the country, such that they rose from 92.8 per cent of the national level in 1949–50 to 94.4 per cent in 1959–60 (see table 13.3). But *per capita* incomes declined from 87.1 per cent of the national average in 1949–50 to 85.1 per cent in 1959–60. Male activity rates in the population of Great Britain aged fifteen and over rose during the period from 76.9 per cent in 1954 to 77.5 per cent in 1960, whereas the comparable rates in the Northern Region showed a fall from 78.9 per cent to 75.9 per cent. This, probably, was the explanation for the seeming fact that although regional differences in income per earner were tending to narrow, the opposite was true of *per capita* incomes.

13.11 In forecasting future personal income in the Northern Region the basic assumption was that the rate of increase in incomes would be the same as that in the country. It has been noted that *per capita* income in the region has recently not been rising as rapidly as in the country. Therefore, any assumption that the rates will increase in parallel is optimistic, but there are grounds for this. The main change is that the structure of employment is likely to alter in favour of there being an increasing proportion of higher paid workers on Teesside than at present. In 1960, the average earnings of male manual workers in Great Britain was only 55 per cent of those of non-manual workers; the disparity was smaller for female workers, manual earnings being 65 per cent of non-manual earnings. It was shown in chapter 6 that the employment structure of Teesside is likely to change during the next twenty-five years as the trend continues for there to be a rapidly increasing proportion of white-collar workers, rising from 36.1 per cent in 1965 to about 48 per cent by 1991.

13.12 The actual method of projection was to relate the growth of personal incomes to the growth of the economy as a whole, measured by gross national product, making assumptions about the future rate of growth. There has been a close relationship between growth in national product and personal income before tax, illustrated in table 13.5.

Table 13.5. Increases in gross national product and personal incomes, 1955–65 (% per annum, 1958 prices)

	gnp at market prices	total personal income before tax	*per capita* income	
			UK	Northern Region
1955–60	2.7	3.3	3.1	3.0
1960–65	3.0	3.7	3.0	2.9

13.13 It is assumed for these projections therefore that for a 1 per cent increase per annum in gross national product, there would be a 1 per cent increase per annum in *per capita* income in the United Kingdom, and that this would result in the same rate of increase in the Northern Region. The assumed rate of increase in gross national product is taken to be 3.0 per cent per annum, but the implications are shown of an increase of 3.5 per cent per annum. This latter rate is probably too rapid for the twenty-five-year period and would raise problems in assuming a direct relationship between *per capita* regional income and gross national product of the type used in the 3.0 per cent forecast.

13.14 The base figure for projecting *per capita* incomes is taken from the Family Expenditure Survey rather than the Inland Revenue reports because there are difficulties in the use of the regional data from the latter source. Incomes of less than £180 per annum were excluded from the Inland Revenue data and some of the regional

Table 13.4. Average income *per capita*, 1949–60 (£ per annum, current prices)

	United Kingdom			Northern Region Index (UK = 100)		
main types of income	1949–50	1954–55	1959–60	1949–50	1954–55	1959–60
salaries, wages and other schedule E incomes	121.3	169.8	225.5	94.9	89.2	90.3
profits and professional earnings	17.3	20.0	22.7	88.7	93.0	89.5
income from property, schedule A and B	3.7	4.1	4.2	81.0	76.6	73.8
total net income	159.0	218.0	293.0	87.1	84.9	85.1

Source: Reports of the Commissioners for Inland Revenue data were incomplete. But the Family Expenditure Survey includes all sources of income according to the place of residence of the family.

Table 13.6. Average *per capita* income, Teesside 1961–65 (£ per annum, 1965 prices)

	United Kingdom	Northern Region
1961–63	404.3	347.0
1963	417.7	*
1964	427.8	*
1965	440.6	*

Source: Family Expenditure Survey.
Notes * no data available.

13.15 Table 13.6 shows the average *per capita* income in the Northern Region according to the Family Expenditure Survey. Between 1960 and 1965, regional *per capita* income was increasing at an average rate of 2.9 per cent per annum giving a projected figure of £378.1 per annum in 1965. Therefore, a rounded figure of £380 per annum has been used as the base figure for projection, to give the forecast of personal incomes in table 13.7.

Table 13.7. Average *per capita* income, Teesside, 1966–91 (£ per annum, 1966 prices)

gnp growth rate, (per cent)	1966	1975	1991
3.0	360	510	765
3.5	380	540	900

Analysis of personal expenditure

13.16 Personal expenditure on goods and services in 1964, according to the Family Expenditure Survey, totalled £341 per head of population in the United Kingdom; it had increased since 1957 by 16 per cent (at constant prices). Personal income however rose more rapidly during the period, so expenditure as a proportion of income was declining. This was the result of an increase in taxes, with the rise in income, and in what can broadly be termed personal savings including such items as insurance payments and pension fund contributions. Within this general context most classes of expenditure increased in absolute terms between 1959 and 1964 but at the same time dropped as a proportion of *per capita* income. Changes in the amount during the period are summarised in table 13.8.

13.17 Detailed examination of the figures in table 13.9 shows that the proportion of income spent on the principal class of expenditure, that on retail goods, fell steadily to 50.6 per cent in 1964, with the proportion spent on durable goods, clothing, furniture, electrical appliances, and other household goods, falling only marginally more slowly than that on convenience goods (food, drink and tobacco). The fall in the proportion spent on convenience goods is only to be expected, as the demand for these, in quantity at least, is largely satisfied for all but the very lowest incomes, but the similar fall in expenditure on durables is surprising. There is, to some extent, conflicting evidence, for the Census of Distribution shows expenditure in durable goods shops increasing by over 13 per cent from 1957–61, compared with an increase of only 7.8 per cent in food and other convenience shops. Much of the discrepancy may be explained by differences in classification between the Census and the Family Expenditure Survey. Both sources indicate a similar increase in the consumption of retail goods as a whole.

Table 13.8. Changes in *per capita* expenditure, United Kingdom, 1957–64 (£ per annum, 1956 prices)

	1957	1964	per cent change 1957–64
convenience goods	96.0	106.2	+ 8.4
durable goods	58.6	64.6	+10.2
total retail	156.6	170.8	+ 9.1
motor vehicles	9.8	19.5	+99.0
public transport	7.0	8.1	+12.8
mass entertainment	3.0	2.3	−23.3
miscellaneous recreation	20.0	29.2	+46.0
housing	38.7	44.0	+13.7
total	233.9	271.5	+16.1

Source: Family Expenditure Survey.
Note: for definition of convenience and durable goods, see chapter 14, paragraph 14.10.

13.18 There is a marked difference in the scale and pattern of personal expenditure in the two sectors of transport, public and private. Expenditure on public transport was relatively stable during the period, the average proportion of income spent remaining constant at about 2.6 per cent although the proportion spent on bus and rail fares dropped slightly. This was balanced by increased expenditure on sea and air travel, and on taxis, very largely by the upper income groups. The proportion of income taken by public transport as a whole decreases as income rises, with travel by sea, air and taxis becoming almost as important as rail travel above a *per capita* weekly income of about £7 10s. or a family income of £25 in 1964.

13.19 Expenditure on private motor vehicles (including running costs) is still only a minor part of total expenditure, but the growth in spending on this item has far outpaced that in any other item, increasing by 99 per cent from £9.8 per annum in 1957 to £19.6 in 1964. The expenditure as a proportion of income likewise increased, from 3.8 to 6.2 per cent during the same period. The number of cars currently licensed in the United Kingdom rose from 3.5 million in 1955 to

Table 13.9 Changes in the distribution of *per capita* expenditure, United Kingdom, 1957–64 (percentage of *per capita* income, 1956 prices)

class of expenditure	1957–59	1958–60	1959–61	1960–62	1961–63	1962–64	1964 (at 1964 prices)
convenience goods	37.7	37.0	36.9	36.6	36.2	35.1	32.0
durable goods	22.6	22.4	22.6	22.2	21.5	20.8	16.8
total retail	60.3	59.4	59.5	58.8	57.7	55.8	50.6
motor vehicles	3.9	5.2	5.7	6.0	5.6	6.1	6.3
public transport	2.8	2.7	2.6	2.6	2.6	2.6	2.6
mass entertainment	1.1	1.0	0.9	0.8	0.7	0.7	0.8
miscellaneous recreation	8.0	8.1	8.5	8.7	9.0	9.1	9.0
housing	14.8	14.2	14.2	14.4	14.6	14.5	16.9
total	90.4	90.4	91.0	90.5	90.1	87.8	85.1

Source: Family Expenditure Surveys, 1957–1964.
Notes: motor vehicles includes running costs;
housing includes rent and rates, mortgage repayments, expenditure on fuel and light.

about 8.5 million in 1964 at an average annual rate of increase of 10 per cent and expenditure on petrol, maintenance, accessories, etc., rose even more rapidly.

13.20 Motor vehicle ownership and expenditure is very much related to level of income; only a small minority of households whose income was less than £20 per week in 1964 (about 48 per cent of all families) owned a vehicle but above that level expenditure steadily increased with income and households whose income was £30 or more spent at least £3 per week. There is a close correlation between the growth of expenditure on this item in the past decade and the growth of incomes in general; and with the average proportion of income spent on motor cars increasing, the trend is for the break between the 'car owners' and the 'non-car owners' to be at a lower income level.

13.21 Expenditure on housing rose almost as rapidly as that on motor cars between 1957 and 1964 at current prices but this was in large part accounted for by an exceptional rise in prices due to the shortage of housing and land available for residential development. At constant prices the proportion of income spent on housing remained fixed between 14 and 15 per cent, the rise in expenditure in real terms balanced by the rise in income. Despite the wide differences in standards of housing, the proportion of income spent on housing falls off markedly with increases in income, from as high as 40 per cent in the lowest income groups to 11 per cent in the highest.

13.22 The classification of expenditure in the Family Expenditure Survey is such that it is impossible to isolate all expenditure on recreation. Those items that can be distinguished are expenditure on mass entertainment, including cinemas, theatres and spectator sports; on alcoholic drinks, the drinking of which is normally a leisure time activity; on meals bought away from home though this includes meals at work; on holidays and on subscriptions to clubs.

13.23 The substantial decline in cinema audiences, which in 1963 were only a quarter of those in 1953, and the steady fall in attendances at professional soccer games, resulted in a downward trend in the importance of expenditure on mass entertainment. In fact, *per capita* expenditure figures for this item, after adjustment for price changes, decreased during the period, the only item in which this happened. This trend over time is contradicted by a noticeable increase in expenditure on mass entertainment with rise in income level, though even at the higher income levels this item takes little more than 1 per cent of income.

13.24 Expenditure on the other recreational activities shows the opposite trend, of a considerable increase in *per capita* expenditure and an increase in the proportion of income used, so that in 1964, at 11s. per week *per capita*, it accounted for 9 per cent of income. There is, further, a more than proportionate increase in expenditure on these items with increases in income. One of the major classes of recreational expenditure which cannot be separated out from the Family Expenditure Survey, that on sports equipment and other recreational goods, was shown by figures produced by the Central Statistical Office to have increased by 50 per cent between 1957 and 1963; it is now taking on average 2 per cent of income.

13.25 It is misleading to look only at average expenditure, for the pattern of consumption varies considerably with level of income. Expenditure on convenience goods, for instance, takes a much greater proportion of income in the lower income groups than in the high ones, varying in 1964 from 49 per cent at the lowest income level to 21 per cent at the highest. In contrast while expenditure in monetary terms on durable goods rose with income, from 16s. weekly *per capita* to 51s., the proportion of income taken was close to 20 per cent at all levels. The variation in pattern of expenditure with change in *per capita* income is illustrated in table 13.10 by two income groups in 1964 lying on either side of, and close to, the mean income level.

13.26 Information on expenditure in the standard regions (for the three-year period 1961–63) is contained in the 1963 Family Expenditure Survey and a summary, comparing the pattern of expenditure in the Northern Region with that in the United Kingdom as a whole is presented in table 13.11. The figures tend to confirm the results of the analysis of regional income made earlier from Inland Revenue data in that *per capita* income and expenditure in the Northern Region are very much below the national levels, and below those of all other regions, apart from Wales, Scotland and Northern Ireland. According to this Survey, average *per capita* income in the

Table 13.10. Changes in *per capita* expenditure as a proportion of income, United Kingdom, 1964

class of expenditure	*per capita* expenditure (shillings per week)		percentage of *per capita* income		percentage change in proportion of income	percentage change in proportion for a given change in income	
	case A	case B	case A	case B			
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
convenience goods	43.5	51.2	39.5	32.3	−18.2	− 1.2	− 1.4
durable goods	21.2	32.0	19.3	20.2	+ 4.6	+ 0.3	+ 0.4
total retail	64.7	83.1	58.8	52.5	−10.7	− 0.7	− 0.9
motor vehicles	4.5	8.8	4.0	5.5	+37.5	+ 2.6	+ 2.9
public transport	3.4	4.6	3.1	2.9	− 6.4	− 0.4	− 0.5
mass entertainment	0.7	1.4	0.6	0.9	+50.0	+ 3.4	+ 4.0
miscellaneous recreation	8.4	14.2	7.6	8.9	+17.1	+ 1.2	+ 1.4
housing	20.6	25.8	18.6	16.2	−12.9	− 0.8	− 1.0
total expenditure	101.1	133.6	91.8	84.5	− 8.0	− 0.5	− 0.6
income	110.0	158.2	100.0	100.0	+43.8	+ 3.0	+ 3.8

Source: Family Expenditure Survey, 1964.

Notes. $\text{col (f)} = \dfrac{\text{col (e)} - \text{col (d)}}{\text{col (e)}} \times 100$

$\text{col (g)} = \text{col (f)} \times \dfrac{3.0}{43.8}$

$\text{col (h)} = \text{col (f)} \times \dfrac{3.8}{43.8}$

Table 13.11. Average *per capita* expenditure, Northern Region, 1961–63

	£ per annum, current prices		Northern Region Index (U.K. = 100)	percentage of *per capita* income	
	U.K.	Northern Region		U.K.	Northern Region
average income per household	1083.2	963.2	88.9	–	–
average persons per household	3.03	3.14	–	–	–
average *per capita* income	357.5	306.7	85.8	100.0	100.0
convenience goods	122.6	120.2	98.0	34.3	39.2
durable goods	72.2	63.1	87.4	20.2	20.6
total retail	194.8	183.3	94.1	54.5	59.7
motor vehicles	21.9	11.1	50.7	6.1	3.6
public transport	9.9	9.3	94.0	2.8	3.0
mass entertainment	2.9	2.6	89.6	0.8	0.8
miscellaneous recreation	31.0	28.2	90.1	8.7	9.2
housing	62.5	46.4	74.2	17.5	15.1
total expenditure	308.4	268.7	87.1	86.3	87.6

Source: Family Expenditure Survey, 1963.

Northern Region at £307 per annum was about 86 per cent of average income in the United Kingdom and average *per capita* expenditure at £269 per annum was 87 per cent of the national level. It must be noted however, that there is no available information on regional prices and so it is not known how great the difference is in real terms. Further, the high levels of income and expenditure in London and the South East inflate the national averages and exaggerate the gap between the other regions and the nation.

13.27 Regional *per capita* expenditure on convenience goods was very close to the national figure and consequently the proportion of income spent on this class of expenditure in the region was about 10 per cent above the United Kingdom proportion, and the proportion spent on all retail goods about 8 per cent higher. Expenditure on durable goods in the region conforms to the overall relationship of about 87 per cent of national expenditure per head.

13.28 There is a second source of information on retail expenditure in the regions, the Census of Distribution. It shows a similar relationship in 1961 between regional and national expenditure, with total retail expenditure per head in the region about 93 per cent of the national average. *Per capita* figures from the two sources vary because of differences in classification and, partly, because the Family Expenditure Survey is based on a small sample and thus liable to errors of approximation.

13.29 According to the Census of Distribution the gap between spending on retail goods in the Northern Region and that of the nation, widened between 1957 and 1961, a trend similar to that of personal income. Total retail expenditure per head in the region fell from 96.5 per cent of the national level to 93.4 per cent, expenditure on convenience goods from 97.5 to 94.9 per cent, and on durables from 95.9 to 91.6 per cent (at constant prices). The Census also indicates that in 1961 expenditure per head on both convenience and durable goods in the Teesside area was very similar to that in the Northern Region as a whole; and as this is the only available information on personal expenditure in the study area it is assumed that all expenditure figures relating to the Northern Region apply to Teesside.

13.30 The greatest variation between the region and the nation in 1961–63 was that in expenditure on motor vehicles. The regional *per capita* figure of £11 per annum was only half the national figure, and it took a very much lower proportion of income, reflecting the fact that a much larger percentage of families in the region are below the income level at which car ownership becomes common. To illustrate the size of the gap, in 1964 there were 9.7 registered motor cars in Middlesbrough per 100 persons and 15.5 motor vehicles of all kinds per 100 persons: in England the ratios were 16.3 and 24.5 respectively.

13.31 Expenditure on housing in the Northern Region was also very low, 74 per cent of the national *per capita* average and a lower proportion of income, probably more a reflection of shortage of housing in the south and midlands, the low quality of housing in the region, and cheaper fuel, than of lower average incomes. Almost a sixth of the population in the Northern Region, for instance, lives in dwellings without a fixed bath or a hot-water system.

13.32 The importance of the other main class of expenditure in the regional pattern, that on recreation, is very similar to its national position. It takes about 10 per cent of income (i.e. mass entertainment and miscellaneous recreation together) in the north and 9.5 per cent in the rest of the country, but relatively more is spent on beer in the north and less on meals out.

Future trends in personal expenditure

13.33 Given a continued growth in national output and in *per capita* income then personal consumption will also rise but at a slower rate and as a decreasing proportion of income. This will be so if only because of the more than proportionate increase in taxation with rise in income, but the relative rates of growth of output and expenditure will depend largely on the rate of voluntary personal saving in one form or another. Because of the need for an increased rate of investment, the National Plan envisaged a parallel increase in personal saving and it is Government policy to encourage this. The Plan suggested that if an annual rate of growth in national production of 4.0 per cent were achieved, it would result annually in a 3.2 per cent increase in total personal consumption, and a 2.4 per cent rise in *per capita* expenditure.

13.34 Beckerman and Associates in *The British Economy in 1975* assumed a slightly lower national growth rate of 3.8 per cent per annum but expected total personal expenditure to increase by 3.3 per cent. American economists have projected *per capita* expenditure in the U.S.A. at 2.4 per cent annually, to 1976, but there is growing evidence that those British projections were over-optimistic and that a rate of growth of 3.0–3.5 per cent per annum is more likely with a consequent reduction in the growth of personal expenditure *per capita* to 2.0–2.2 per cent. However, given the lower average level of incomes in the Northern Region it is likely that the rate of growth in personal expenditure in the Region might be more rapid than in the country.

13.35 An increasing part of total expenditure is on services not passing through retail channels, so expenditure on retail goods is not likely to grow at the same rate as total expenditure but probably at about 1.8 per cent per annum given an overall growth rate of 3.0–3.5 per cent. Consumption of food is growing, not so much in quantity as in quality, with the change to more expensive food-stuffs and more elaborate processing. But expenditure on food is relatively insensitive to income changes and it will decline as a proportion of income and total expenditure. The long-term decline in the consumption of alcohol has been reversed in recent years by changes in social habits and the increase in expenditure on wines and spirits is expected to continue. This should to some extent be balanced by the fall in the rate of increase of tobacco sales; the National Plan suggested that the consumption of tobacco would be at the same level in 1970 as in 1960 with a slight increase in expenditure.

13 36 Future trends in durable goods are more difficult to assess for there is a problem of estimating the overall effect of the varying growth rates of the individual items. Expenditure on clothing is expected to continue to decline as a proportion of income, and to increase only slightly as a proportion of total expenditure despite the effect of rapid changes in fashion and real improvements in quality. The high rate of increase in expenditure on household appliances in recent years can be fairly confidently projected, at least to 1976, a trend towards American patterns of consumption, and while *per capita* expenditure on furniture was virtually static between 1959 and 1964, it is thought that the increase in new housing will stimulate some upward movement in expenditure on this item. On balance it seems likely that expenditure on durable retail goods as a whole (including fast growing items such as chemists and sports goods) will increase slightly as a proportion of income, though not sufficiently to offset the declining rate in convenience goods.

13.37 It has been estimated that registration of new cars will increase at about 8 to 9 per cent per annum until 1975, compared with 10 per cent between 1965 and 1964, with total expenditure on motor vehicles rising at a similar rate. In the National Plan it was argued, on the basis of international comparisons, that there would be a slackening of expansion by 1970. But there would still then be substantially less than one car per family according to projections made by the Road Research Laboratory and, given the present widespread urge to car ownership and likely future income levels, the assumption is questionable. Planning and restriction on the use of private cars in urban areas, and congestion due to lack of planning might affect car sales, but probably only marginally.

13 38 There has been a decline in use of public transport, but the fast rise in sea and air travel, the halting of the decline in inter-town transport and the possible extension of restrictions on private vehicles in the major cities, may at least stabilise expenditure on public transport relative to income.

13.39 The stock of private houses in 1976 will be about 17 per cent above the 1860 level and it is hoped that the number of dwellings will increase by 12 per cent between 1964 and 1970, but personal expenditure on housing is expected to rise rather more rapidly as a result of improvements in quality and increases in repairs undertaken by owners. There should be a continuing demand for greater comfort and convenience, and consumption of fuel and light in 1976 is expected to be double the 1960 level, but against this past trends indicate a decreasing proportion of income spent on housing.

13.40 The decline in cinema attendances has been so great that it is likely to slow down and expenditure to settle at a level not very much below the present one, while expenditure on other forms of mass entertainment such as the theatre and concerts can reasonably be expected to rise with income and education. There is a great deal of evidence to suggest that the high rate of increase of expenditure on recreation in general will be maintained as income, mobility and leisure time rise.

Forecasts of expenditure

13 41 To forecast future *per capita* expenditure, the proportions of income spent on various items were projected, and applied to the forecasts of *per capita* income. Simple extrapolation of past trends in *per capita* expenditure would not give due weight to the effects of rising incomes and recent short-term trends might have been distorted by temporary circumstances. This same problem might also apply to attempts at a simple extrapolation of trends in the proportion of income spent on different items. Indeed, trial forecasts using these extrapolation techniques did sometimes give results at variance with the reasonable expectations of changes in expenditure shown by the analysis.

13.42 Therefore greatest reliance was placed on the analysis of the way in which the proportion of income spent on different items changed in 1964 as the total level of income changed. The results of the analysis for 1964 were comparable with those for earlier years. Certain minor modifications were made in the light of present expectations, and the final forecasts of the proportional expenditure of income were very similar to those made in *The British Economy to 1975*. Finally, a check was exercised on the predicted overall level of expenditure by ensuring that the implicit level of savings and taxation, expressed as a percentage of income, would not rise too rapidly.

13.43 The final forecasts, for the alternative rates of growth of 3.0 and 3.5 per cent per annum in gross national product, are shown in tables 13.12 and 13.13. It must be stressed that the forecast of 3.0 per cent is the operational forecast for planning as it gives a minimum reasonable level of future expenditure. The table gives, as well, the calculated levels of income and expenditure for 1966.

Distribution of personal income

13.44 The main source of data for the geographical distribution of income on Teesside is the Home Interview Survey. Each household was asked to give an approximate indication of its average weekly earnings according to comparatively broad classes. In the event, 78.8 per cent of the households which responded to the Home Interview Survey were willing to answer this question, giving the results shown in table 13.14.

13.45 The arithmetic mean household income is about £19 9 per week, and, as the average household size is 3 34 persons, the average *per capita* income is £310 per annum. This figure is only 81 per cent of that calculated for the Northern Region from the Family Expenditure Survey, namely £380. However, the Home

Table 13.12. Forecast of *per capita* expenditure as a proportion of percentage of income, Teesside, 1991

		growth in g.n.p. = 3.0 per cent p.a.		growth in g.n.p. = 3.5 per cent p.a.	
	1966	1978	1991	1978	1991
C.O.D. classification:					
consumer goods	31.1	28.1	23.3	27.5	21.8
durable goods	19.8	20.1	20.9	20.2	21.7
total retail	50.9	48.2	44.2	47.7	43.5
F.E.S. classification:					
consumer goods	35.8	32.5	26.9	31.7	25.1
durable goods	19.4	19.8	21.0	19.9	21.3
total retail	85.2	52.3	47.9	51.6	46.4
motor vehicles	4.6	8.1	8.2	5.7	9.1
public transport	2.7	2.5	2.4	2.4	2.3
mass entertainment	0.8	1.1	1.5	1.1	1.5
personal services etc.	8.9	8.2	8.9	7.7	7.3
housing	15.3	18.3	15.5	15.5	14.6
total expenditure (rounded)	88.5	85.5	82.4	84.0	81.3
income	100	100	100	100	100

Note: for explanation of definitions, see table 13.13.

Table 13.13. Forecast of *per capita* expenditure, Teesside, 1991 (£ per annum, 1966 prices)

		growth in g.n.p. = 3.0 per cent p.a.		growth in g.n.p. = 3.5 per cent p.a.	
	1966	1975	1991	1976	1991
C.O.D. classification;					
consumer goods	118.0	143.7	185.4	148.4	195.9
durable goods	75.3	102.7	169.8	109.3	195.0
total retail	193.3	246.4	358.2	287.7	390.9
F.E.S. classification:					
consumer goods	136.1	165.7	213.8	171.2	225.9
durable goods	74.0	101.0	187.0	107.5	191.7
total retail	210.1	266.7	380.8	278.7	417.6
motor vehicles	17.5	28.0	65.2	30.8	81.8
public transport	10.2	12.8	16.0	12.9	20.7
mass entertainment	3.0	5.8	11.9	5.9	14.4
personal services, etc.	33.8	41.8	54.9	41.6	66.7
housing	62.0	83.1	123.2	83.7	131.4
total expenditure	336.8	436.0	858.0	453.6	731.7
total income	380	510	795	540	900

Note: the analysis and forecast of retail expenditure was made on the basis of the Family Expenditure Survey (F.E.S.) definition. Figures were converted to the Census of Distribution (C.O.D.) definition for use in chapter 14. The conversion factors for the Northern Region were taken from Department of Town and Country Planning, University of Manchester, *Regional Shopping Centres, a planning report on North West England* (1964), p. 169. *Index numbers of* per capita *expenditure, Northern Region, 1961*

	F.E.S.	C.O.D.
convenience goods	100	86.7
durable goods	100	101.8
total retail	100	92.0

Table 13.14. Average weekly earned income per household, Teesside, 1966

income class	number of households
£ 0–12 per week	29,085
£13–17 „ „	20,593
£18–22 „ „	21,865
£23–27 „ „	14,738
£28–32 „ „	10,800
over £33 „ „	18,468

Source: Home Interview Survey.

Interview Survey asked for information about earned income. The Inland Revenue data showed that about 85 per cent of net *per capita* income in the region was earned, that is, wages, salaries, profits and professional earnings. The remainder, about 15 per cent was unearned and included income from investments, property, pensions, family allowances. These were sources of income not covered in the Home Interview Survey.

13.46 If this information is accepted as reliable, its geographical distribution is shown on figure 13.1 based on the median household income in each coarse zone. The pattern shows a clear band of low income households in the older residential areas of Stockton, Thornaby, Middlesbrough and Eston, and in the rural areas north of the Tees valley and in East Cleveland. The higher income areas are confined to the southern suburbs of Middlesbrough, and west and south-west of Stockton.

13.47 The analysis in chapter 12 showed that the distribution of household incomes in 1966 could be described by a multiple regression equation as follows:

$$y = 11.942 + 7.249x_1 - 0.630x_2 + 2.547x_5 + 0.482\,(x_{11})^2 - 2.081\,(x_1.x_{11})$$

where y = average weekly household income in zone
x_1 = modal age of dwellings in zone
x_2 = level of pollution in zone
x_5 = altitude of zone
x_{11} = average rooms per dwelling.

13.48 A comparison between the actual household incomes, recorded in the surveys, and those predicted by this equation shows that 88.5 per cent of the predicted values lie within the range £13–£22 per week, compared with 79.9 per cent of the actual values. That is, the equation tends to understate the actual value in zones with a high weekly income, and overstate those with low incomes.

13.49 The likely zonal values of the independent variables in 1991 were forecast for the recommended urban structure. The future modal age and average size of dwelling were discussed in chapters 9 and 10 and the future level of pollution in chapter 22. A computer was then used to predict the average household income of each fine zone in 1991, using the changed values of the independent variables.

13.50 This calculation gave the distribution of average household incomes likely to be associated with the recommended urban structure by 1991, but at 1966 prices and 1966 real incomes. It showed that the average weekly income would lie within the range £20.75–£21.55 at 95 per cent level of confidence, that is, a significantly higher income than that recorded for 1965. The predicted values of average household income can be converted to 1991 real incomes, at 1986 prices, using a factor of 2.07, derived by the following calculation:

	1966	1991
a population of Teesside	478,870	703,830
b *per capita* annual income, 1966 prices	£380	£795
c total income = (a) × (b)	£181,970,600	£559,544,860
d number of households	143,374	212,774
e average annual household income = (c) ÷ (d)	£1,289	£2,830
f index of *per capita* income	100	209
∴ index of household income	100	207

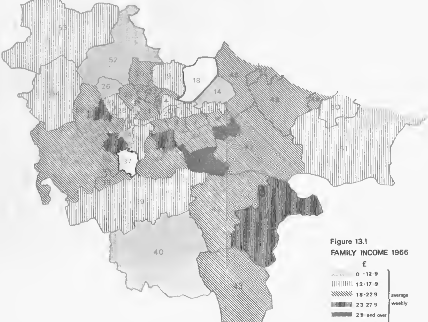


Figure 13.1
FAMILY INCOME 1966

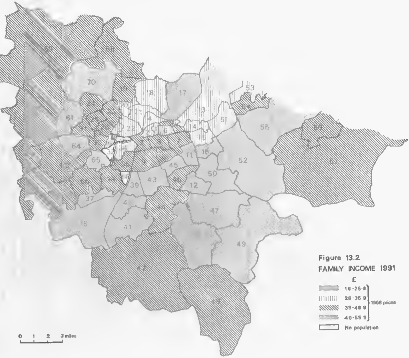


Figure 13.2
FAMILY INCOME 1991

13.51 The forecast distribution of household income in 1991, generalised on the coarse zone system, is shown in figure 13.2. The main changes since 1966 are likely to be:

a the general level of incomes will be higher, even without the correction for the increase in real incomes between 1966 and 1991;

b Levenside, including Yarm but excluding Ingleby Barwick, is likely to become the area with the highest incomes in 1991;

c Nunthorpe, Merton and the southern suburbs of Middlesbrough and Eston will remain a relatively high income area but not as dominant as it was in 1966;

d the small towns of Stokesley, Great Ayton, Guisborough and the coastal area of Saltburn and Marske will become relatively high income areas compared with their average status in 1966;

e the western suburbs of Stockton, together with the new development at Wolviston is likely to become an area of relatively high incomes;

f the low income areas will remain concentrated along the river Tees at Stockton, north Thornaby, north Middlesbrough and north Eston;

g there is likely to be a relative decline in the status of the older parts of Billingham and parts of Eston.

Distribution of retail expenditure

13.52 Information about the geographical distribution of *per capita* expenditure on convenience and durable goods is needed for use in the sales distribution model described in chapter 14. No direct evidence is available from the surveys and therefore estimates have to be made, derived from the data on incomes. But it was noted in paragraph 13.48 that use of the regression equation for predicting the average household income per zone tends to underestimate income in the wealthier zones, and overestimate it in the poorer zones. The sales distribution model is used strictly to compare and evaluate shopping patterns in 1966 and 1991. It is preferable, therefore, to use the predicted incomes derived from the regression equation in paragraph 13.47 both for 1966 and 1991. This gives two sets of comparable data whereas use of the actual observations for 1966 would introduce errors.

13.53 It was shown in paragraph 13.45 that data from the Home Interview Survey account for about 81 per cent of household income from all sources. It was assumed, none-the-less, that the data would give a reliable indication of the pattern of incomes and that the deficiency in the data would be uniformly distributed throughout Teesside. But, because of their lower average values, it was not possible to use the estimates of household income directly. Instead, the recorded average income for each zone was expressed as a percentage of the average income for Teesside. Estimates of the *per capita* expenditure in each zone were then made by relating money values of expenditure to index numbers of the level of income in the zones.

13.54 The relationship between index numbers of *per capita* income and money values of *per capita* expenditure were calculated from the Family Expenditure Survey, 1966, as follows:

a three different levels of family income were selected and the weekly expenditure on convenience and durable goods calculated, both income and expenditure being expressed in *per capita* terms;

b the figures for each income level were converted into pounds per annum, and to the definitions of the Census of Distribution, incomes being expressed as a percentage of the average figure for Teesside, namely £380.

13.55 The resultant relationship is that given in table 13.15 and the zonal figures of *per capita* expenditure on convenience and durable goods in 1965 were interpolated directly from the table.

13.56 A simplified system was used to forecast the 1991 distribution of *per capita* expenditure. Detailed analysis of the results of the predictions of zonal incomes showed there to be a strong tendency for the results to be grouped into three classes. These classes corresponded to those used for collecting the original Home Interview Survey data, namely £12–17, £18–22 and £23–28 weekly household income. Therefore, only three levels of income were recognised for the 1991 prediction, high, medium and low. The average *per capita* income for each of these classes was calculated at 1991 values and the corresponding values of *per capita* expenditure estimated from the relationship in table 13.16. The final values are those shown in table 13.16.

Table 13.15. Relationship between income and retail expenditure, Teesside 1966 (£ per annum)

per capita income	index number of *per capita* income (Teesside = 100)	*per capita* expenditure	
		convenience goods	durable goods
494 (a)	130	128.8	100.7
362 (a)	95	112.0	70.7
258 (a)	66	93.5	49.5
380 (b)	100	116.0	75.3

Sources: (a) Family Expenditure Survey, 1966;
(b) Teesside, table 3.13.

Table 13.16. Forecasts of zonal income and expenditure, Teesside, 1991 (£ per annum, 1966 prices)

type of zone	*per capita* income	index number of *per capita* income (Teesside = 100)	*per capita* expenditure	
			convenience goods	durable goods
high income	989	125	201	214
average	795	100	185	170
low income	595	75	162	122

14 Shopping

A shopping policy for Teesside

14.1 Teesside in 1966 has a highly distinctive pattern of shopping, a pattern that is in strong contrast to that of most other urban areas in the country. In the first place, the Teesside Survey Area is, on balance, a remarkably self-contained area for shopping purposes. People make shopping journeys across the survey boundary but the numbers entering Teesside to shop are nearly equalled by the numbers leaving. Secondly, the area has two major centres, at Middlesbrough and Stockton, that are competing for trade and that have divided the area between them. People living in most of Teesside go either to Stockton, or to Middlesbrough, but very seldom to both centres for their shopping needs.

14.2 At the more local level, Teesside is served by a medley of local shopping centres and markets, shopping streets and corner shops. But the beginnings of a hierarchy can be identified, particularly at Redcar and Billingham. The former is an old established seaside and residential town with its own central area. Billingham is the site of a completely new, large shopping centre, serving the prewar and postwar housing estates that make up the urban district. A similar centre is under construction at Thornaby.

14.3 The pattern of shopping centres to be recommended as part of the urban structure policy for Teesside represents a development, and, in some cases, a modification in the trends now at work in the area. Its main features are:

a central Middlesbrough should be developed as the dominant regional shopping centre serving the whole of Teesside; its floorspace should be expanded from 1.2 million in 1966 to 2.6 million square feet by 1991;

b central Stockton should remain the major shopping centre serving western Teesside; its floorspace should grow from 0.6 million to 1.1 million square feet by 1991;

c existing plans and proposals for central Redcar and for the new centres at Billingham and Thornaby should be implemented, but further growth should not be encouraged;

d smaller, district shopping centres are needed to serve areas with a local population of about 50,000. The centres should have between 50,000 and about 100,000 square feet of floorspace. New centres will be needed in the areas of proposed new development but in addition certain existing centres should be allowed to expand;

e local shopping services should be catered for probably by small centres or groups of shops, of about 20,000 square feet of floorspace serving a population of about 7,000.

14.4 The analysis and argument leading to the definition of this policy is described in this chapter. The process starts with an estimate of the distribution of retail sales on Teesside in 1966. From this, a hierarchy of existing shopping centres is elucidated, the system being described not only in terms of retail sales, but also by the characteristics of shopping trips made to centres of different status, and of the hinterlands of the various centres. The Teesside system is then compared with shopping in other parts of the country, its strengths and weaknesses identified and a possible shopping policy defined for the future Teesside. The policy is described quantitatively in terms of the assumed retail sales attracted to each centre and, after further analysis, the likely amount of shopping floorspace required for this volume of trade.

14.5 The rest of the procedure is devoted to an evaluation and elaboration of this shopping policy. A sales distribution model is used to predict the retail sales likely at each centre given the assumed amount of shopping floorspace and the distinction of population on Teesside. The model had previously been calibrated, using the pattern of population and retail sales on Teesside in 1966. The rates of sales per square foot of floorspace implied by the prediction of sales in 1991 were analysed to establish whether the proposed shopping policy would be commercially feasible, and a final definition was then made of shopping policy.

14.6 It must be stressed that the entire analysis is directed at establishing a long-term policy for the size and location of shopping centres as a part of urban structure policy. More work is required to establish the precise phasing and location of development for any one particular centre. A certain amount of this work has been done for the central areas of Middlesbrough, Stockton and Redcar; it is described in Volume I, chapters 8, 10 and 11. But work on testing the precise commercial feasibility of any single development still remains to be done as it would depend on a detailed analysis of retail sales, construction costs and rents made at the time of designing the particular scheme.

Basic sources and definitions

14.7 The main sources of data used in this chapter are:

a the *Census of Distribution*, 1951, 1957 and 1961, made by the Board of Trade; unpublished data from the 1961 census was made available by special arrangement with the Board of Trade;

b The *Family Expenditure Survey*, made annually by the Ministry of Labour;

c The Home Interview Survey;

d The Land Use Survey;

e The analysis and forecasts of income and expenditure, from chapter 13.

14.8 The method of analysis follows closely that used in *Regional Shopping Centres, a planning report on North West England,* by the Department of Town and Country Planning, University of Manchester, 1964; supplementary volume on the use of a retail sales distribution model, 1967. In addition, three recent reports on shopping on Teesside were used.

Gerald Eve & Co. Ltd.; *Report on Central Area Redevelopment;* a report on retailing for central Middlesbrough, prepared for Middlesbrough Corporation, 1964;

J. G. Poulson & Co. *High Street Comprehensive Development Area;* a report on the comprehensive redevelopment of central Stockton, prepared for Stockton Corporation, 1963;

Development Analysis, *Redcar Central Area Redevelopment,* prepared for Redcar Corporation, 1965.

14.9 The retail sales distribution model used during the evaluation is that described by T. R. Lakshmanan and Walter G. Hansen in the *Journal of the American Institute of Planners,* June 1966. Use of the model is described in the supplementary report of the University of Manchester. The model was calibrated for Teesside conditions by a program developed by C.E.I.R. Ltd.

Definitions

14.10 The retail trade is described in this chapter in terms of annual sales of 'convenience' and 'durable' goods at prices holding in December 1965, unless the contrary is indicated. The definition of retail trade, convenience and durable goods are those used in the 1961 Census of Distribution, namely,

convenience goods are all goods sold in the first three categories of retail outlet, that is, grocers; other food retailers; and confectioners, tobacconists and newsagents;

durable goods are all goods sold in the last four categories of retail outlet, that is, clothing and footwear shops; household goods shops; other non-food retailers; and general stores (that is, general variety and department stores).

14.11 This definition therefore includes all the traditional types of retail outlet including market stalls and kiosks. But it excludes retail sales through other types of outlet, including restaurants and public houses; electricity and gas show-rooms; motor-car sales-rooms, service stations and garages; service trades, including hairdressers, and shoe repairers. The definition also excludes retail sales through automatic vending machines, mail order firms and discount stores.

14.12 The definition refers to sales of all types of commodity made through a particular type of outlet. For instance, food is sold not only through the usual types of food shop included in the category of convenience goods, but also in the food departments of general stores. A more reliable source on retail sales by actual type of commodity sold is provided by the Family Expenditure Survey. Data from this source has been classified as follows:

convenience goods are all foods, including meals bought away from home; alcoholic drink, including sales through public houses; and tobacco;

durable goods are clothing and footwear; durable household goods; and other goods.

14.13 Despite its weaknesses, the Census of Distribution definition is that used throughout this report as it provides the most complete survey of retail sales in their geographical distribution. The relationship between the two definitions is given in the footnote to table 13.13.

14.14 Shopping floorspace is always defined as the gross area of floorspace devoted to sales, storage and auxiliary uses, such as administration.

14.15 The analysis and forecast of the geographical distribution of retail sales is made at two levels of generalisation:

a the coarse zone system (fifty-eight internal zones in 1966, seventy in 1991) is used for the calibration of the retail sales distribution model and the prediction of sales in 1991;

b the fine zone system (211 internal zones) is used to define the location of individual shopping centres in the shopping analysis; and an estimate is made of the distribution of sales by fine zone in 1966 and 1991 for the purposes of the transportation analysis.

The distribution of retail sales, 1966

External shopping trips

14.16 The first problem in measuring the distribution of retail sales in 1966 is to establish whether the Teesside Survey Area can be regarded as self-contained for the purposes of shopping, that is, whether the purchasing power generated by the resident population equals the total volume of retail sales in the area's shops. All the indications in fact suggest that this is the situation on Teesside.

14.17 At the time of the 1961 Census of Distribution, total retail sales in the Survey Area were about £68 million at 1961 prices. This figure was about 6 per cent less than the total purchasing power in the area, given by multiplying population by the average *per capita* expenditure in the Northern Region. But, as the apparent deficit was greater in convenience goods than durable goods, the figures can be questioned. All the evidence on patterns of shopping behaviour suggests that an area as large as Teesside would be virtually self-contained for convenience goods but might be in deficit for durable goods. The possible source of error is the assumption that average *per capita* expenditure for the Northern Region could be accepted for Tesside. These figures would suggest that Teesside *per capita* expenditure might be slightly higher than the average for the region.

14.18 A more detailed source is data from the Home Interview and Cordon Surveys, showing details of shopping journeys crossing the boundary of the survey area (see table 14.1). This shows that although 13,000 home-to-shop trips were made across the boundary of the area, and that these formed 14 per cent of all shopping trips made within, or to, Teesside, nevertheless the number of outgoing trips to centres such as Darlington was just exceeded by the number of incoming trips to Teesside shopping centres. The net effect was for a slightly greater number of incoming trips, equal to about 3 per cent of all shopping trips in the survey area This is sufficiently small for Teesside to be regarded as a self-contained shopping area.

14.19 Table 14.1 shows that Darlington was by far the most important external centre for Teessiders, reflecting the attractiveness of its shopping centre. Visitors from Darlington also comprised the largest sector of visitors to Teesside shopping centres. Hartlepool provided the next largest number of shoppers coming to Teesside, but it was less frequented by Teessiders. The figures for the northern area indicate the limited significance of

Table 14.1. Average weekday person-trips, home-to-shop, Teesside, 1966

area of origin-destination	incoming	outgoing	total	net
Hartlepool	1,300	600	1,900	800
Darlington–Aycliffe	1,600	2,300	3,900	–600
South West Durham	1,000	400	1,500	600
Mid and East Durham	300	900	1,200	600
Whitby	1,000	500	1,400	500
remainder, north	600	500	1,000	100
remainder, south	900	1,200	2,100	–300
sub-total, crossing boundary	7,300	5,700	13,000	1,700
sub-total, internal trips	–	–	76,900	–
TOTAL (rounded)	–	–	89,900	–

Source Home Interview and Cordon Surveys.
Note a person-trip in this table includes the trip from home-to-shop and the return trip to home; incoming trips are those made by people living outside Teesside, the source of data being the Cordon Survey, outgoing trips are those made by Teesside residents.

expenditure by Teessiders in the main shopping centre in the region at Newcastle.

Distribution of sales by fine zone

14.20 No survey data is available giving the distribution of retail sales in 1966 according to the zoning systems. The most recent source is the 1961 Census of Distribution and that is complete only for local authority areas. Therefore, an estimate has been made of the distribution, basically by multiplying the number of shops within each zone, according to the Land Use Survey, by the average sales per shop, according to the Census of Distribution. The calculation was carried out separately for the seven categories of retail outlet in the Census, and the average sales per shop was calculated separately for shops in a variety of different types of location.

14.21 The total number of shops on Teesside in 1966 was estimated at 3,623 according to the Land Use Survey. The only method of checking the reliability of this figure is to compare it with that given by the 1961 Census. Table 14.2 shows that the estimate for durable goods shops is probably reasonable, given the five years difference in dates of survey. But the figure for convenience goods shops is less reasonable notwithstanding the general trend for the number of these shops to decline. The explanation lies probably in the much more detailed definition of retail outlet used in the Census. It includes many categories which were not identified in the Land Use Survey, including kiosks in cinemas and other places; roundsmen's depots; mobile shops; credit traders calling on customers; shops within another shop, for instance in a department store; and market stalls.

Table 14.2. Number of shops, Teesside, 1961–66

	convenience goods	durable goods	total
1961, Census of Distribution	2,619	1,312	3,931
1966, Land Use Survey	2,209	1,414	3,623

14.22 The average annual sales in each of the seven categories of retail outlet was calculated using data from the 1961 Census. The published figures made possible separate calculations for each of the local authority areas and for central Middlesbrough and central Stockton. Unpublished data from the Census made possible a further refinement, distinguishing between shops in smaller centres and scattered local shops. The figures for 1961 were adjusted for the average increase in prices and the total increase in retail trade in each category between 1961 and 1966 and, on the basis of national and regional trends, for the probable change in the number of shops. The net result of these factors was that the average sales in each type of shop increased by about 14.5 per cent between mid-1961 and December 1965 at current prices. The results are summarised in table 14.3.

14.23 The estimated retail sales in each fine zone were then calculated for each of the seven categories of shop given in table 14.3, by multiplying the number of shops in the Land Use Survey by the average annual sales per shop in the relevant type of zone. It was possible to check the validity of this estimate by comparing the total retail sales on Teesside calculated by this method with that calculated by multiplying the total population of Teesside by the average *per capita* expenditure in table 13.13. The results are shown in table 14.4.

Table 14.4. Comparison of total retail expenditure, Teesside, 1966 (£'000's)

	convenience goods	durable goods
(a) by aggregating fine zone data	40,712	39,260
(b) by average *per capita* expenditure	56,507	36,059

14.24 The estimated expenditure on convenience goods given by aggregating the fine zone data is 26 per cent less than that derived from *per capita* expenditure. The analysis in chapter 13 shows that the latter figure is reasonably reliable and is certainly not subject to an error of this magnitude. But table 14.2 shows that there is certainly a deficiency in the number of convenience goods shops in the Land Use Survey which could be sufficiently large to account for most of this error. As the location of the missing retail outlets cannot be precisely determined, the only solution has been to assume that the total expenditure on convenience goods is about £56.5 million and to apply a constant correction

Table 14.3. Average annual sales per shop, Teesside, 1966 (£'000's)

	central areas			
	Middlesbrough	Stockton	local centres	other local shops
grocers	66.0	53.6	17–33	16–28
other food shops	19.4	23.1	8–19	9–18
sweets, tobacconists and newsagents	18.9	20.0	12–26	9–18
clothing and footwear	52.0	26.1	6–15	6–10
household goods	32.3	50.4	6–11	4–17
other non-food shops	30.4	25.4	7–31	7–17
general stores	685.0	516.0	24–77	20–74

Note figures were calculated for a number of local centres and for other local shops in different parts of Teesside; these results show the ranges of figures obtained.

factor of 1.38 to each fine zone estimate of convenience sales. It is probable that the effect of this correction factor is to underestimate convenience sales in large centres and to overestimate those in local centres.

14.25 The estimated sales in durable goods from the fine zone calculation is about 9 per cent higher than that given by the *per capita* method. Although this difference, £3 million, is substantial there is no way of assessing whether it is statistically significant. Given the general character of the assumptions about *per capita* expenditure, and the possibility that they are underestimates, and the average size of shop, it has been assumed that the fine zone calculation gives a reasonable estimate of the distribution of sales in durable goods

Analysis of shopping, Teesside, 1966

Shopping centres on Teesside

14.26 Detailed examination of the Land Use Survey shows that fifty-one nucleated shopping centres can be identified on Teesside. They are listed below, together with the fine zones in which they are located. A map of the fine zone system is given in chapter 7, figures 7.2 and 7.3.

central Middlesbrough	1, 2, 18, 28
central Stockton	122, 123
central Redcar	155, 158
three areas near central Middlesbrough	10–2, 15–7, 19, 29, 30
three areas near central Stockton	109, 119–20, 124–6
one area near central Redcar	158, 159, 161
Billingham Town Centre	87–8
South Bank	71
Mandale Road, Thornaby	131, 133
Guisborough	172
four old industrial centres	4, 20, 23–4, 68, 91–2
four former villages and small towns	32, 34, 79, 95–6, 99, 185, 167, 190
eighteen new suburban centres	28, 35–7, 40, 43–6, 51, 58–9, 81, 75, 86, 100–1, 151, 154, 157, 209
four mining villages	188–9, 188, 200
four rural villages and small towns	143, 174–5, 193

14.27 Definitions in terms of the fine zones are necessarily generalised but, nevertheless, analysis of the retail sales of the fine zones in which these centres are located provides the basis for a first description of Teesside's shopping in 1966 (see table 14.5).

14.28 The definitions of the central areas of Middlesbrough and Stockton are not very satisfactory but they had to be used to correspond with the coarse zones used in the subsequent evaluation. The definition of Middlesbrough includes the same principal shopping streets as those used in the Census of Distribution, and in the analysis of Middlesbrough's shopping prepared by Gerald Eve & Co. It thus includes that stretch of Linthorpe Road south of Borough Road as far as Albert Park, a section which the Gerald Eve Report confirms has a different character from the main shopping centre along Linthorpe Road north of Borough Road. This is discussed in detail in Volume I, chapter 8, but the essence is that south Linthorpe Road contains a higher proportion of sales in convenience goods and has less of the character of a main shopping centre.

14.29 The definition of Stockton central area is the same as that used by J. G. Poulson & Co., in their report on Stockton's shopping. It is thus confined virtually to the High Street of Stockton.

14.30 The main shopping centre of Redcar is located along the High Street and the Esplanade, which includes a large amount of sales in seasonal, or holiday trade. It covers the same area as that in the report by Development Analysts Ltd.

14.31 Each of these centres has leading directly from it, or adjacent to it, areas of mixed shopping, services and houses still in residential use. These peripheral areas include Newport Road, Parliament Road and Corporation Road at Middlesbrough, Norton Road, Bishopton Lane and Yarm Lane, Stockton, and the area behind Lord Street at Redcar. As is shown in table 14.5, the character of these peripheral areas is markedly different from the central areas, a much greater proportion of their trade being in convenience goods.

14.32 Four other shopping centres are large or have a large proportion of their trade in durable goods. Billingham Town Centre is the new shopping centre that has been under construction since the early 1950's associated with the large postwar development of housing in that area. South Bank and Mandale Road, Thornaby are the two largest shopping centres in the older industrial parts of Teesside. Both are poorer quality shopping centres though serving a large, local population. Finally, Guisborough is a small market town that has recently become an important centre for people wishing to live in an attractive environment and able to afford the costs of journey to work back to Teesside.

14.33 The four old industrial centres are smaller versions of South Bank (see table 14.6). The growth of each of

Table 14.5. Annual retail sales in shopping centres, Teesside, 1966 (£'000's)

	convenience goods	durable goods	total sales	percentage of trade in durable goods
Middlesbrough	5,874	16,823	22,506	74.0
Stockton	2,732	9,382	12,114	77.3
Redcar	2,263	2,728	4,991	54.7
Middlesbrough, peripheral	6,003	1,729	7,732	22.4
Stockton, peripheral	2,375	845	3,220	28.2
Redcar, peripheral	1,106	322	1,428	22.8
Billingham Town Centre	911	856	1,767	48.8
South Bank	2,820	854	3,374	25.3
Mandale Road, Thornaby	1,928	578	2,507	22.8
Guisborough	1,851	638	2,189	29.2
old industrial centres	3,695	806	4,801	17.8
former villages and small towns	8,178	1,683	7,881	21.4
new suburban centres	5,913	997	6,910	13.2
mining villages	2,207	237	2,444	9.7
rural villages and small towns	1,983	301	2,284	13.2
others, scattered	8,042	633	8,678	7.3
TOTAL	56,192	38,260	95,452	41.3

Table 14.6. Old industrial centres, Teesside, 1966

	annual sales (£'000's)	percentage of sales in durable goods
North Ormesby	2,224	17.1
Grangetown	1,240	18.9
Haverton Hill	592	16.5
St Hilda's	445	26.3

them was associated with the development of a small community close to new industrial areas in the nineteenth and early twentieth centuries. Each, except Haverton Hill, has or had a weekly street market.

14.34 A number of former villages and small towns have become part of the suburbs of Teesside but have definite shopping centres (see table 14.7). They are a mixed group, including some that are growing, such as Eston, and some that face decline, such as Station Road, Billingham which was the original village centre but is being supplanted by the new Town Centre. Saltburn and Loftus have been included in this group, as they share some of its characteristics, though they are still separate, small towns.

Table 14.7. Former villages and small towns, Teesside, 1966

	annual sales (£'000's)	percentage of sales in durable goods
Billingham, Station Road	1,144	30.7
Norton	1,114	14.7
Eston	1,140	15.6
Linthorpe	1,118	26.5
Marske	1,025	19.8
Saltburn	1,090	21.7
Loftus	1,229	23.3

14.35 Eighteen newer suburban shopping centres can be identified. They are reasonably uniform in their sales characteristics: their average annual sales are between £200,000 and £700,000, with an average of £400,000 of which 13 per cent is in durable goods. They include new postwar centres such as at Berwick Hills, Middlesbrough or Roseworth, Stockton; interwar centres, as at Roman Road and Marton Grove, Middlesbrough, older villages, now overtaken by suburban growth as at Ormesby, Normanby, Nunthorpe and Marton.

14.36 A scattering of small shopping centres are located in the former iron ore mining area of East Cleveland and in the small part of the Durham coalfield within the Survey Area. The main centres are at Skelton, Brotton and Lingdale in Cleveland, and Fishburn in Durham. Their trade is comparatively small, about £600,000 each, and a very high proportion of it is in convenience goods.

14.37 Four villages, or small market towns, have shopping centres each with about £600,000 annual sales. They are Sedgefield, Yarm, Stokesley and Great Ayton.

14.38 Finally, about 9 per cent of the total retail sales of the area, almost entirely in convenience goods, is located in very small centres or widely scattered groups of shops. Virtually all of this trade is located in the older suburbs and by-law housing areas of urban Teesside.

Shopping trips on Teesside

14.39 A certain amount of information is available about the behaviour of shoppers on Teesside from the Home Interview Survey. The first item concerns the mode of travel for convenience and durable goods (see table 14.8). The most important feature of this table is the vast number of shopping trips that are made on foot, mainly for convenience goods, although a significant number of shopping trips for durable goods are also walking trips. Of the trips that are made by some sort of vehicle, about 60 per cent are made by public transport, whether they are for convenience or durable goods.

14.40 One characteristic of these shopping trips is their average length. The pattern (table 14.9) is typical, with larger journeys being made by car and public transport, and for durable goods. The longer time of a journey by

Table 14.9. Median trip length, by mode of travel, Teesside, 1966 (minutes)

	convenience goods	durable goods	total
public transport	18.7	23.3	20.5
car	12.5	16.1	13.5
walk	8.5	10.1	8.6
others	7.8	11.7	6.6
average	10.6	17.2	13.0

Note trip length is the difference between the time of departure from zone of production (e.g. home), and the time of arrival at the zone of attraction (i.e. shops); the mode is the predominant mode of travel. Thus all journeys will probably include a certain amount of walking, but only those that are exclusively on foot are so classified.

14.8. Average weekly number of trips, by mode of travel, Teesside, 1966

	convenience goods	per cent	durable goods	per cent	total	per cent
public transport	65,891	16.6	44,814	41.6	110,705	22.0
car	40,355	10.2	28,553	26.4	68,908	13.6
walk	283,976	71.5	32,109	29.8	316,085	62.7
others	8,545	1.7	2,415	2.2	6,960	1.7
TOTAL	398,767	100.0	107,891	100.0	504,658	100.0

Source Home Interview Survey.

Notes: a The average weekly number of trips is a combination of data from two sources:
(i) Home Interview Survey, weekday sample of trips Monday to Friday, special subsample distinguishing all trips whose stated purpose was for consumer goods or durable goods;
(ii) Home Interview Survey, weekend sample of trips, Saturday and Sunday;
The two sources were combined, expanded to give a true representation of average daily trips, for a seven-day week, and multiplied by seven to give the weekly number of trips.

b The following definitions of mode of travel apply:
public transport: bus or train passenger; car: car driver, van driver, car or lorry passenger; walk: the entire trip being made on foot; other: taxi passenger, lorry driver, motor or pedal cycle, driver or passenger.

c The total number of trips includes all shopping trips whose zone of production was inside the survey area. It thus includes trips to centres outside the survey area, but excludes trips from outside the survey area.

d The distinction between convenience and durable goods trips is arbitrary, as people were asked to specify the dominant purpose although some trips would be for both types of goods.

public transport is partly a consequence of periods spent waiting at a bus stop and in walking to and from the stop. The longer trips for durable goods reflect the more concentrated pattern of durable goods outlets in a few centres.

14.41 The data about shopping trips so far described are reasonably reliable as they refer to average figures for a very large sample covering the whole of Teesside. It is possible to make more tentative calculations about the characteristics of shopping trips to selected centres though the reliability of this data is likely to be much poorer for the smaller centres. The data are presented in table 14.11. The table shows variations in both the median journey length to centres and the estimated average expenditure on these trips. In general, the larger the centre, the longer is the median journey length that people are prepared to make, ranging from about 5 minutes to Sedgefield to nearly 20 minutes to central Middlesbrough. In similar fashion, although the average amount of money spent on a shopping trip on Teesside is about £3.67, it can rise as much as £6.18 on trips to central Middlesbrough, or fall to less than £2 on trips to North Ormesby. Very roughly, this data can be generalised into the form shown in table 14 10 showing the relationship between size of centre, length of shopping trip and expenditure on the trip.

Table 14.10. Size of centre, length and expenditure per shopping trip, Teesside, 1966

annual sales (£ million)	median journey length (minutes)	average expenditure per trip (£)
0.2	5	0.5
1.0	10	2.0
7.0	15	4.0
25.0	20	6.0

14 42 There are three apparent exceptions to this generalisation. Two centres are both, apparently, associated with a much greater average expenditure per shopping trip. They are Loftus and Sedgefield which are smaller centres very close to the edge of the Survey Area. Both clearly attract a certain amount of trade from beyond the boundaries of the Survey Area. The third case, that of South Bank, is much more difficult to explain. Partly, it will lie in the tendency for this method of calculating the distribution of retail sales to overestimate sales in such centres. Partly, too, South Bank may be fulfilling an important role as a shopping centre for a much wider area of southern Eston. There is some evidence for this, in that the median length of trip to South Bank for durable goods is quite long (20 minutes), though it is not statistically reliable.

Shopping hinterlands on Teesside

14 43 The final information about shopping behaviour gleaned from the Home Interview Survey related to the hinterlands of Middlesbrough, Stockton, Billingham and Redcar. The division of Teesside between Middlesbrough and Stockton is shown in figure 14.1. Its most striking feature is the almost complete absence of

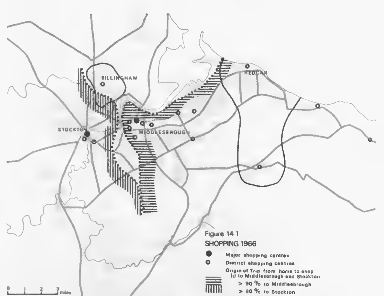

BILLINGHAM
REDCAR
STOCKTON
MIDDLESBROUGH
0
1
2
3
miles
● Major shopping centres
○ District shopping centres
Origin of Trip from home to shop
(i) to Middlesbrough and Stockton
> 90 % to Middlesbrough
> 90 % to Stockton
(ii) to Middlesbrough, Stockton Redcar & Billingham
> 30 % to Redcar and Billingham

Figure 14 1
SHOPPING 1966

Table 14.11. Shopping trips to selected centres, Teesside, 1966

central area	number of trips per 7-day week	median length of journey (minutes)	average sales per trip (£)	average annual sales (£ million)
(1)	(2)	(3)	(4)	(5)
Middlesbrough	70,063	19.9	6.18	22.5
Stockton	64,601	17.9	4.09	13.8
Redcar	29,680	15.1	3.23	5.0
Billingham Town Centre	14,909	10.9	2.28	1.8
South Bank	10,556	10.4	6.15	3.4
Guisborough	12,481	11.8	3.37	2.2
old industrial centres:				
North Ormesby	15,827	14.0	1.90	1.8
Grangetown	8,575	8.2	2.78	1.2
former villages and small towns:				
Linthorpe	9,443	9.7	2.28	1.1
Loftus	4,088	8.3	5.76	1.2
new suburban centres	95,459	9.3	4.03	0.9
mining village:				
Skelton	3,010	12.0	3.18	0.5
rural villages and small towns:				
Stokesley	4,214	13.2	2.23	0.5
Yarm	3,297	12.6	3.41	0.6
Sedgefield	1,281	6.4	8.95	0.6
others, scattered	111,111	7.5	2.97	–

Notes: a The definitions of central areas were those in the extraction of data from the Home Interview Survey and differ slightly from those in paragraph 14.28. The extraction had to be done some time before the full analysis of land use and shopping sales revealed the greater validity of the latter definitions. The main differences in this table are:

(i) Stockton includes parts of Yarm Lane and Norton Road;

(ii) new suburban centres includes a much larger number of centres, classed differently in paragraph 14.26, including St. Hilda's; Mandale Road, Thornaby; Station Road, Billingham; Newport Road; Haverton Hill; Eston;

(iii) a number of centres listed in paragraph 14.26 were not included in the data extractions.

b The number of trips is defined in the note to table 14.8; the small sample size means that, probably, the estimates for any centre with less than about 20,000 trips are statistically unreliable.

c Average sales per trip is calculated by dividing annual sales by the annual number of trips (=52 × weekly number).

ambiguity. The map shows the proportion of shopping trips made by residents of each coarse zone to either Stockton or Middlesbrough central areas. West of Billingham and Stainsby Becks virtually all such trips have Stockton as their destination; to the east, the destination is Middlesbrough. The only exception is in Billingham which is evenly divided in its allegiance between the two centres.

14.44 The two smaller centres also show reasonably well defined hinterlands. All the recorded trips to Billingham town centre had their origins within the Billingham urban district, and from that area, the town centre attracted as many shopping trips as Middlesbrough and Stockton together.

14.45 Redcar apparently has a more extensive hinterland. At its core is Redcar municipal borough and Marske. Redcar centre attracts a much larger number of trips from these areas than does Middlesbrough. In fact, a shopping trip from this area to Middlesbrough is comparatively rare. But, further away, the attractions of a trip to Redcar wane rapidly. Thus Saltburn, Loftus and Guisborough owe greater allegiance to Middlesbrough than to Redcar notwithstanding the greater distances involved.

14.46 The information from these various sources can be brought together to illustrate the characteristics of the shopping hinterland of different shopping centres. To illustrate this, residential areas have been selected in the western suburbs of Stockton, Billingham, the southern suburbs of Middlesbrough, Redcar and the coast as far as East Cleveland. The basic method is to compare the retail expenditure generated by the resident population; the pattern and volume of local retail sales within the area being studied; and the distribution of shopping trips made by the area's residents.

West Stockton

14.47 The area selected for study extends from Norton in the north-east, through the housing areas along Durham Road (A177) as far south as Fairfield. The main relevant facts are given in table 14.12 which shows that 52 per cent of the purchasing power for convenience goods, but only 9 per cent of that for durable goods is spent at shops within the area.

Table 14.12. Analysis of retail sales and expenditure, west Stockton, 1966 (£ per annum)

	convenience goods	durable goods
population: 61,190		
average *per capita* expenditure	117.7	63.6
total expenditure	7,211,000	6,120,000
total retail sales	3,721,000	449,000
net expenditure spent outside area	3,490,000	4,671,000
percentage of expenditure spent outside area	48.4	91.3
estimated average *per capita* expenditure spent:		
in central Stockton	54.4	72.8
in central Middlesbrough	2.6	3.5
in local shops within the area	60.7	7.3

Note: west Stockton is coarse zones 25, 27, 28, 32, 33.

14.48 The main local shopping centres in western Stockton include Norton Village (£1,114,000 annual sales); new centres at Roseworth (£224,000) and Hardwick (£208,000); old strips of shopping along and immediately behind Norton Road (£552,000), Durham Road (£759,000) and Oxbridge Lane (£799,000); and £516,000 in widely scattered individual shops and small groups. The clear aim of postwar policy is indicated by the new shopping centres at Roseworth and Hardwick, that is groups of between ten and twenty shops serving a local hinterland.

14.49 The analysis of shopping trips shows that on average each person makes two shopping trips each week, including those made on Saturdays, a total of 120,500 trips from the whole population of the area. Of these, 48.4 per cent are made to the central area of Stockton; 2.6 per cent to Middlesbrough; and 49.0

per cent are made to other shopping centres. The geographical pattern of shops makes it clear that virtually all this latter group of trips must be made to the local shops within west Stockton as none are made to Billingham town centre, the only other sizeable shopping centre near at hand. From this, it is possible to calculate the approximate distribution of retail expenditure, showing how much, on average, is spent locally and how much at the two central areas.

Billingham

14.50 A similar analysis can be made for the Billingham urban district but it reveals a strikingly different pattern from that in west Stockton. The main source of difference is the new Billingham Town Centre. This had an estimated annual retail sales in 1966 of £1,767,000 of which nearly half was in durable goods. The centre is entirely a creation of the postwar years and, at the time of survey, had a considerable amount of space for car parking, full pedestrian segregation, offices, both municipal and central government; a bowling centre and hotel, and two-level shopping including national stores. Since the time of survey, the centre has been further extended with more shops and car parking and a forum offering a full range of sports and recreation facilities and a theatre.

14.51 Apart from the town centre, Billingham's shopping facilities were similar to those of west Stockton. They included the original village centre, Station Road (annual sales, £1,114,000); the shopping centre for Haverton Hill (£592,000), the shops along the main A19 road near Roseberry Avenue (£46,000); and smaller groups at Wolviston, Port Clarence and elsewhere (£541,000).

14.52 The effect of this different pattern of local shopping is shown in table 14.13; a much smaller proportion of the total expenditure by Billingham residents is spent outside Billingham, especially on durable goods. As in west Stockton, people tend to make about two shopping trips per week of which 11.9 per cent are to central Stockton; 6.1 per cent to central Middlesbrough; 33.0 per cent to Billingham Town Centre; and 49.0 per cent to local shops or other, unnamed centres. But, at the time of survey, virtually no trips were made to the Town Centre from places outside the Billingham residential area.

Table 14.13. Analysis of retail sales and expenditure, Billingham, 1966 (£ per annum)

	convenience goods	durable goods
population 36, 620		
average *per capita* expenditure	124.0	79.5
total expenditure	4,541 000	2 912,000
total retail sales	3,077 000	1,527 000
net expenditure spent outside area	1,464 000	1 385,000
percentage of expenditure spent outside area	32.3	47.6
estimated average *per capita* expenditure spent		
in central Stockton	13.5	12.7
in central Middlesbrough	26.5	25.1
in Billingham town centre	24.9	23.4
in local shops, probably within area	58.1	18.3

Note Billingham is coarse zones 18–23

14.53 In summary, it appears that the main effect of the Town Centre has probably been felt on retail sales in central Stockton and, probably to a lesser extent, at central Middlesbrough. Retail expenditure in local shops in Billingham is substantially the same as that in west Stockton.

South Middlesbrough

14.54 The same method of analysis has been applied to two suburban areas in south Middlesbrough. One is the belt of inner suburbs from Thorntree, through Linthorpe to Acklam Road. In this area of 70 000 people, shopping facilities take the form of a number of small centres such as those at Thorntree, Marton Grove, Roman Road, and a larger centre at Linthorpe, where the annual sales is about £1,119,000. The area is a mixture of interwar suburbs and suburbs built immediately after the war. Shopping habits have had time to settle down, and also, trade has built up sufficiently to attract shopkeepers to the area, within the limitations of a planning policy designed to create small shopping centres of ten to twenty shops.

14.55 The second suburban area is that extending from Ormesby in the east through Marton and Saltersgill to Acklam in the west. Its population was 33,000 in 1966 but much of its development is very recent and still under way. Shopping centres exist at Ormesby, Marton and Saltersgill Avenue but they are still only slightly developed. This area is substantially richer than the inner suburbs, average *per capita* expenditure being nearly 30 per cent higher.

Table 14.14. Average *per capita* expenditure, south Middlesbrough, 1966 (£ per annum)

	convenience goods	durable goods
Thorntree and Linthorpe		
expenditure in central Middlesbrough	58.3	57.2
in central Stockton	1.8	1.8
in local shopping	51.4	9.4
TOTAL	111.5	68.4
Ormesby and Acklam		
expenditure in central Middlesbrough	86.3	82.1
in central Stockton	8.6	8.0
in local shopping	32.3	2.7
TOTAL	127.6	92.8

Note Thorntree and Linthorpe is coarse zones 7–9; Ormesby and Acklam is coarse zones 10–12.

14.56 The pattern of shopping in the two areas is quite different, as is shown in table 14.14. The slightly higher expenditure at central Stockton from the latter area is a reflection, probably, of the comparative ease of movement between Acklam and Stockton. But the main difference is in the amount of spending in local shops. That in the inner suburbs is broadly similar to that at west Stockton and Billingham. The low level of expenditure in the outer suburbs is probably more a reflection of their recent date of construction and that shopping development has not caught up with housing.

The coastal areas

14.57 The problem in using this method of analysis for residential areas at Redcar and East Cleveland is that the central areas of Redcar and Loftus both attract a certain amount of trade from beyond the areas used in the analysis. The probable levels of expenditure are shown in table 14.15. The figures for Redcar and Marske are more tentative, not only because of the trade attracted to the central area in Redcar from the residents of Guisborough, Saltburn and Loftus, but also because of the effects of the holiday trade. Even so, the High Street at Redcar is clearly providing, to an even greater degree, the same type of service as that given by Billingham

Table 14.15. Average *per capita* expenditure, the coastal areas, 1966 (£ per annum)

		convenience goods	durable goods
Redcar and Marske			
expenditure	in central Redcar	47.9	55.2
	in central Middlesbrough	6.3	20.2
	in local shopping	72.3	15.0
TOTAL		126.5	90.4
Saltburn and East Cleveland			
expenditure	in central Redcar	0	11.8
	in central Loftus	26.6	10.3
	in central Middlesbrough	0	38.3
	in local shopping	86.9	9.9
TOTAL		113.5	70.3

Note: Redcar and Marske is coarse zones 46–48; Saltburn and East Cleveland is coarse zones 50 and 51.

Town Centre. It is a substitute for the type of service given by Stockton or Middlesbrough central areas, and the purely local shopping trade remains unaffected by the presence of the High Street's superior shopping facilities.

14.58 In East Cleveland, too, the subordinate centres of Redcar and Loftus attract trade that might otherwise have gone to Middlesbrough. But the local shopping facilities for convenience goods within the area are intensively used by the local residents, as the table shows.

The shopping hierarchy, 1966

14.59 This review of data and analysis of shopping on Teesside shows that three levels of shopping centre can be recognised:

a the two major centres at Middlesbrough and Stockton;

b a series of district centres including Redcar and Billingham Town Centre; South Bank, North Ormesby and Mandale Road, Thornaby; Guisborough and Loftus; and the peripheral shopping streets around central Stockton and Middlesbrough have many of the same characteristics;

c local shopping, including small centres, groups of shops and corner shops.

The division between the first two levels is clear and precise; that between the latter two is much more arbitrary although there is clearly a difference of kind as well as degree between, say, Billingham Town Centre and the shopping centre at Roseworth. The main characteristics of the hierarchy are summarised in table 14.16.

The major centres

14.60 The characteristic feature of the two major centres is that their hinterlands are mutually exclusive but cover the whole of Teesside. People from every part of the Survey Area do at least some of their retail expenditure at either Stockton or Middlesbrough but neither centre can draw customers from the whole of Teesside. This failure of one centre to become dominant is partly the result of historic patterns of development. Stockton is the older centre but during the last eighty years population growth has been greater south of Middlesbrough. But the failure is also partly a consequence of a pair of interrelated factors, the distance from residential areas to a shopping centre and its attraction as a centre.

14.61 First, the time that people on Teesside spend on shopping journeys is comparatively short. Even to the two main centres, the average shopping journey lasts less than twenty minutes. This means that neither centre is within easy access of the whole of Teesside. It is possible, however, that with increasing car ownership, an improved road system, and a public transport policy for the whole of Teesside, this situation may change. It will be possible for greater distances to be covered with little increase in journey times such that a greater proportion of Teesside could live within easy access of a single shopping centre.

Table 14.16. Features of the shopping hierarchy, Teesside, 1966

	major centres	district centres	local shopping
per capita expenditure (£ per annum)			
convenience goods	20.0	35.5	82.5
durable goods	55.7	15.6	4.0
average annual sales per centre (£'000's)			
convenience goods	4,760	1,730	–
durable goods	13,340	730	–
total	18,120	2,460	–
range of annual sales per centre (£'000's)	13,750–22,500	1,140–4,930	–
average proportion of sales in durable goods (%)	73.6	29.6	14.2
range of proportion of sales in durable goods (%)	73.0–74.0	17.1–54.7	–
mean length of shopping trip (minutes)	18.9	12.8	9.2
mean expenditure per shopping trip (£)	5.2	3.3	1.0

14.62 The second factor that leads to the division of Teesside into two hinterlands is that neither centre is markedly more attractive than the other. Stockton has its twice weekly retail market that probably attracts many people who would otherwise not come to Stockton. But Middlesbrough has more department stores, and a few specialist shops. Neither attraction, however, is sufficient to give pre-eminence to the one centre.

14.63 But it is also true that until one centre is more easily accessible and has a greater population within its catchment area, it is unlikely to provide the sort of location in which more specialist shops, and a greater variety of shops would wish to locate. That is, the two factors of the attraction of the shopping centre, and the size of its hinterland (in terms of population within easy access) are completely interrelated.

The district centres

14.64 These fulfill an intermediate role, providing a smaller range of services to a more purely local hinterland. The table masks, however, the more clearly expressed character of Billingham and Redcar. Half the total sales in these two centres is in durable goods, compared with only a quarter in the other centres. The main impact of all these centres is to take away trade that would otherwise have gone to the main shopping centres. This is clear from the analysis both of Redcar and Billingham. In neither centre's hinterland is the volume of purely local shopping significantly affected by the presence of a district centre. It is difficult to measure the population required to support a district shopping centre with precision because of the local circumstances of accessibility and competition from other district centres. But, roughly, about 50,000 is probably the required level, given by dividing the average *per capita* expenditure into the average sales in such centres

Local shopping

14.65 The local shopping centres are a very mixed group of facilities that none-the-less provide more than half the total retail sales in convenience goods on Teesside. They cover, for instance, the corner shops and shopping streets in the older housing areas. But the recent pattern, fostered by planning policy, has been the growth of small planned shopping centres such as Roseworth or Thorntree, serving between five and ten thousand people. This policy is probably supported by trends in the nature of the retail trade. Thus the growth of supermarkets, and the increase in the smallest size of shop that is commercially viable both lead to a situation whereby fewer shops are needed to serve a given population. In these circumstances, the demand is for small centres rather than scattered, individual shops, so that smaller shops can be sited close to the supermarkets and benefit from proximity to their drawing power. This trend, too, is reinforced by the greater mobility of shoppers and the change in their patterns of behaviour. A greater proportion of the expenditure on convenience goods tends to be spent on a single, weekly shopping trip to a shopping centre which will include a supermarket

The aims of shopping policy

14.66 The definition of future shopping policy for Teesside has to take these three constituents of the shopping hierarchy in 1966 and decide whether the pattern is that best equipped to satisfy the likely needs of the future population of Teesside. This has to be considered particularly in the light of a growing population; a rising level of income and expenditure; increasing car ownership; and the move for urban renewal and redevelopment in the older parts of Teesside. Above all, the definition of a shopping policy has to be made in the knowledge that a successful and efficient system of shopping could do much to improve the quality of life on Teesside and thus be one of the features that might help attract inward migration to the area.

Major shopping centres

14.67 The analysis of shopping centres in North West England given in the Manchester University report established a threefold hierarchy. Grade I centres, of which there were only two, the centres of Manchester and Liverpool, were fully equipped regional shopping centres. Grade II centres were the central areas of most of the larger towns of the region. Some of the better ones, such as Bolton or Stockport, were described as IIA, the poorer ones, such as Bury and Crewe, as IIB. But both subcategories provided roughly the same range of choice of shopping services. The Grade III centres were analysed in rather less detail; they included large suburban centres in the main conurbations as well as the centres of smaller towns

14.68 Comparison with the results of this analysis shows that Middlesbrough is an example of a grade IIA centre, Stockton of a grade IIB (see table 14.17). Indeed, in some respects Middlesbrough has characteristics which could make it a centre serving the whole of Teesside though, in fact, analysis of the actual pattern of shopping journeys shows that this did not happen in 1966

14.69 But the differences between the two Teesside centres and their analogies in North West England are as significant as the similarities. The first crucial difference is that Middlesbrough and, to an even greater extent, Stockton capture a much greater proportion of the total expenditure on durable goods generated by the population of their hinterlands than is the general case in North West England. More than 80 per cent of the total expenditure on durable goods in Stockton's hinterland is spent in the central area, and nearly 70 per cent of that in Middlesbrough. This degree of dominance is attained because of the lack of grade III centres at the next level in the shopping hierarchy. Only Redcar is a true example of such a centre on Teesside, fulfilling the role of centres such as Leigh or Altrincham in North West England. Billingham is rapidly developing into such a centre but there are no other examples.

14.70 Secondly, both major centres depend to a greater degree on sales of convenience goods than is the case in North West England. This statistic is meaningful mainly as a crude indication of the character and quality of a shopping centre but it proved to be possibly the strongest single indicator of role and status in the analysis of shopping centres in the North West.

14.71 The third difference between Teesside and North West England is that the residents of Teesside do not have easy access to a regional shopping centre of grade I status such as is open to the people of North West England. The distinguishing features of Liverpool and Manchester, the regional centres for North West England, are that they had annual sales in excess of £60 million in 1966; of this trade, over 90 per cent was in durable goods; they each drew upon a hinterland of more than a million people, attracting about 4 per cent

Table 14.17. Characteristics of Middlesbrough and Stockton shopping centres, 1966

	average centres in North West England			
	grade IIA	grade IIB	Middlesbrough	Stockton
population of hinterland ('000's)	265	140	320	160
size of central area, (£ millions, 1966 prices)	14.1	8.1	22.5	13.7
percentage of central area trade in durable goods	78.1	71.2	74.0	73.0
percentage of hinterland in central area:				
convenience goods	9.4	14.9	15.7	19.6
durable goods	45.5	47.6	69.4	82.9
total	25.1	28.2	36.6	44.3
percentage of total trade of Teesside in central area:				
convenience goods	–	–	10.4	6.6
durable goods	–	–	42.3	25.6
total	–	–	23.6	14.4

Source: Department of Town and Country Planning, University of Manchester, *Regional Shopping Centres, a planning report on North West England*, 1964.

Note: the sizes of central areas in North West England have been adjusted to give estimated values for 1966.

of the convenience expenditure and 57 per cent of the durable goods expenditure; and the greater part of the population of North West England is within 40 minutes travelling time of one or the other of the two centres. In contrast, the nearest centre to Teesside of comparable status is at Newcastle, which is more than 60 minutes travelling time away.

14.72 It is true that Teesside is too small at present to support a regional shopping centre that would be fully comparable with Newcastle, where annual sales now are probably about £50 million of which 89 per cent is in durable goods. But, if the right conditions of accessibility were created to give, say, Middlesbrough the chance of becoming such a centre; and if traders were sufficiently attracted by the potential purchasing power of the whole of Teesside; then it might prove possible to foster the growth of Middlesbrough into a relatively small, but dominant regional centre for Teesside. In present-day terms, this would give Middlesbrough sales of about £25 million to £30 million per annum, compared with its present actual figure of £22 million.

14.73 A policy of fostering the development of such a centre is neccessary as part of the creation of a new image for Teesside. For instance, discussions with leading industrialists in Teesside, and other local comment indicate that the absence of such a centre, with its associated commercial and cultural facilities, is a weakness when comparing Teesside with other conurbations of similar population. This failure is attributed directly to the division of resources between two, competing centres on Teesside.

14.74 Three possible alternative locations could be suggested for such a centre, namely, either of the existing major centres at Stockton or Middlesbrough or at an entirely new location. More detailed consideration shows that Middlesbrough is the only location, for three reasons.

a A prediction and analysis of the likely volume of sales such a centre would have to attract shows that it would not be possible for either Stockton or a new site to attract the necessary volume unless the existing Middlesbrough central area were to lose almost all of its retail trade. But the trade of Middlesbrough is already so much greater than that of its nearest competitor, Stockton, that it could achieve a dominant status causing Stockton actually to lose trade.

b Accessibility to central Middlesbrough will be markedly improved within ten years by the construction of the new A19, crossing the river Tees immediately upstream from Newport Bridge, and the construction of the so-called Northern Route from the A19 passing immediately to the north of the central area.

c Central Middlesbrough has room for expansion in a westward direction, and the space and opportunity for a major programme of redevelopment on a scale greater than that at Stockton.

Other shopping

14.75 The necessity for district centres as part of a hierarchy is demonstrated by the success of Billingham Town Centre, showing that it is clearly meeting the requirements for having good shopping facilities within a comparatively short distance of home. The inevitable greater dispersal of population that will be a feature of urban structure policy means that further centres should be planned.

14.76 Finally, local shopping centres will continue to be required to serve an immediate hinterland with its daily and weekly requirements for convenience goods.

The definition of shopping policy

Sales and shopping floorspace

14.77 The most practical method of defining a reasonably precise shopping policy is to set out the location and volume of shopping floorspace that should be developed to achieve the aims set out in the preceding section. As will be shown, the key statistic for this is the existing level of retail sales per square foot of floorspace and the probable future levels. The paucity of information means that even the 1966 levels are in the nature of estimates, based on assumption, rather than actual observed levels. For this reason, the policy should be seen more as indicating the relative amount of change in floorspace between 1966 and 1991 rather than a precise forecast of the floorspace in 1991.

14.78 It is possible to derive reasonable estimates of rates of sales per square foot for the two major centres from the earlier surveys referred to in paragraph 14.8. These gave the turnover in Middlesbrough as being £14.5 per square foot in 1961 and £12.0 per square foot in central Stockton. Known changes in land use since that time and the estimated increase in retail sales enable an estimate to be made for the figure in 1966 (see table 14.18). But much less data is available for the other parts of Teesside. Nevertheless, an attempt has been made to measure seperately the rate for Billingham, because of its significance as the largest completely modern shopping centre on Teesside. The main sources for this were the Land Use Survey and the estimates of the distribution of retail sales.

Table 14.18. Estimated sales per square foot, Teesside, 1966 (£ per annum)

	convenience goods	durable goods	total
Middlesbrough	25.1	16.4	18.0
Stockton	20.2	13.9	15.0
Billingham	30.8	18.8	22.2
others	21.0	14.0	19.2
average	21.9	15.3	18.6

14.79 But the level of sales per square foot does not only vary spatially. It is continuously changing under the impact of the increasing levels in *per capita* expenditure, reported in chapter 13; improvements in retailing methods; and through the process of redevelopment, whereby new, more efficiently designed buildings replace the converted dwellings in which, for instance, many of Middlesbrough's shops are housed. The strength of this last factor is illustrated by comparing the average rate of turnover in Middlesbrough, at £14.5 per square foot in 1961, with that in the newly constructed centre of Stevenage, at £21 per square foot; and some consultants considered the latter figure to be on the low side, with £28 per square foot being the mark of an efficient central area shop.

14.80 Many shopping consultants, including those responsible for the reports on Middlesbrough and Redcar, have analysed past trends and projected future rates of increase in sales per square foot. Comparison of these consultants' reports shows some variation in the projections. The maximum and minimum rates of increase are shown in table 14.19.

Table 14.19. Annual rate of increase in sales per square foot (per cent) 1966-1991

	convenience goods	durable goods	total
1966–81	1.4–2.9	1.6–3.1	1.5–3.0
1981–91	0.6–0.9	0.8–1.1	0.7–1.0

14.81 It seems likely that the rate of increase will be faster in future in durable goods shops because the food trade has recently experienced great changes in organisation and selling methods which have had their effect on sales per square foot whereas these new methods have only begun to appear in the non-food shops. Also, as the proportion of floorspace devoted to selling and display continues to rise, so will average rate of turnover. But it seems probable most of the feasible changes to the design of existing shops and buildings will be made as soon as possible, and that current changes in retailing methods will have lost much of their momentum by 1980. Therefore, the rate of increase in efficiency will be slower in the 1980's than in the 1970's, but the average level of turnover per square foot in shopping centres as a whole will be closer to those for the most up-to-date new shops. The application of the compound rates of increase in table 14.19 to the current values of sales per square foot on Teesside gives the approximate figures for 1981 and 1991 shown in table 14.20.

Table 14.20. Projected sales per square foot, Teesside, 1991 (£ per annum, 1966 prices)

	convenience goods	durable goods	total
central Middlesbrough			
1966	25.1	16.4	18.0
1981	27.8–36.0	17.5–24.0	20.3–26.2
1991	31.5–39.6	20.7–26.1	23.6–30.5
new shopping centres			
1966	30.6	18.8	22.2
1981	42.4	28.4	32.8
1991	44.1	31.0	35.0
other shopping centres			
1966	21.0	14.0	19.2
1981	23.2–30.2	14.9–20.5	21.6–30.1
1991	26.4–33.3	17.7–22.3	25.4–32.8
average, Teesside			
1966	21.9	15.3	18.8
1981	24.2–31.4	16.4–22.4	21.0–28.2
1991	27.6–34.7	19.3–24.4	24.6–31.8

Total floorspace requirement, Teesside, 1966–91

14.82 Before considering the details of shopping distribution, it is necessary to make some general comments on the total scale of increase in the amount of floorspace likely to be required on Teesside during the next twenty-five years. It seems possible that somewhere between 3.5 and 5.8 million square feet of additional floorspace might be needed for all types of shopping if *per capita* expenditure rises at the rate forecast in table 13.13 (see table 14.21).

Table 14.21. Total additional shopping floorspace, Teesside, 1966–91 (million square feet)

	1966	1991	change 1966–91
assuming high rate of sales per square foot:			
convenience goods	2.57	3.76	+1.19
durable goods	2.58	4.89	+2.31
total	5.16	8.65	+3.50
assuming low rate of sales per square foot:			
convenience goods	2.57	4.72	+2.15
durable goods	2.58	6.19	+3.61
total	5.16	10.91	+5.75

14.83 Several major conclusions stem from this analysis. The variation in the forecasts of total floorspace caused by alternative assumptions about turnover per square foot is excessive. To recapitulate, the low rate of turnover, leading to the high forecast of total floorspace, is based on an assumption that technological progress in retailing and the rate of physical redevelopment will be relatively slow. But, if this were to happen, it is unlikely that the economic circumstances of Teesside would be such that new construction of shops would take place on the scale set out in this forecast. The maximum forecast is inconsistent as it combines a pessimistic assumption about retailing and redevelopment and an optimistic assumption about population growth and regional economic growth.

14.84 Therefore, policy decisions should be based on the assumption that future rates of turnover will be relatively high and the floorspace requirements for shopping on Teesside be more in accord with the minimum forecast. The assumptions will then be internally consistent: technological progress in retailing; a high rate of redevelopment; and, still, a substantial amount of new construction, 3,500,000 square feet for the whole of Teesside in twenty-five years.

The distribution of shopping floorspace, 1991

Middlesbrough

14.85 The creation of the conditions that would lead to the development at Middlesbrough of a dominant regional shopping centre forms the main objective of shopping policy. The conditions include improved accessibility via roads and public transport and the provision of adequate car parking facilities; a distribution of population which gives a sufficiently large number of people in its hinterland to sustain the regional centre; and the redevelopment of the central area of Middlesbrough. The success of the policy will depend on decisions by potential customers to use the centre; by shopkeepers and other interests to invest in the centre; and by the local authority to sustain the policy by its use of planning powers.

14.86 For the policy to be successful, it is likely that the gross amount of shopping floorspace in the centre would have to more than double (see table 14.22). The key assumption in this calculation is that the proportion of the total retail expenditure on durable goods by the population of Teesside made in central Middlesbrough will rise from its present level of 42.3 per cent to about 50 per cent by 1991. By comparison, the study of North West England showed that the average grade IIA shopping centre attracted 45 per cent of the expenditure on durable goods by the resident population in its hinterland, and the two regional centres of Liverpool and Manchester attracted 57 per cent of the expenditure on durable goods in their hinterlands.

Table 14.22. Shopping floorspace, central Middlesbrough, 1966–91 (million square feet)

	convenience goods	durable goods	total
1966	0.233	1.014	1.247
1981	0.266	1.405	1.671
1991	0.300	2.300	2.600

14.87 The second main assumption is that the proportion of total sales in the central area in durable goods will rise from 74 per cent in 1965 to about 84 per cent by 1991. This is in comparison with figures for North West England of 78 per cent in grade IIA shopping centres and 91 per cent in the regional shopping centres.

14.88 Both assumptions are that central Middlesbrough will have acquired more of the characteristics of a dominant regional shopping centre in the sense that it will have captured an increased proportion of the trade in durable goods in Teesside; and that the centre will concentrate to an even greater degree on trade in durable goods. However, the calculation indicates minimum quantities of floorspace as, first, they are based on the lower forecasts of growth in *per capita* expenditure, associated with an annual rate of increase of 3.0 per cent in gross national product; and, second, they assume that improvements in the rate of sales per square foot of floorspace will be rapid because technical efficiency in retailing and redevelopment are both likely to be at their greatest in a regional centre.

Stockton

14.89 Forecasts for Stockton are much more difficult to prepare, mainly because a much greater proportion of its present hinterland is likely to be affected by the large district shopping centres under construction at Thornaby and Billingham. These two developments will mean that instead of the central area attracting more than 80 per cent of the trade in durable goods in its hinterland, the proportion will be considerably lower. But the degree to which this will have been reduced by 1991 is very difficult to assess. If it were to have the typical characteristics of a grade II centre in North West England, central Stockton would attract about 46 per cent of the expenditure on durable goods by the population in its hinterland compared with its current rate of 83 per cent. As a basis for calculation, it is therefore assumed that this proportion will trend towards 46 per cent but at a slow rate, such that central Stockton will attract about 60 per cent of the trade in durable goods in its hinterland, which is the equivalent of 20 per cent of the durable goods trade of Teesside. In similar fashion, it is assumed that the proportion of convenience goods expenditure in Teesside that is spent in central Stockton will fall from 6.6 per cent to about 5 per cent.

14.90 Thus the policy for central Stockton is that it will retain as much of its present function as possible, that of an important shopping centre serving the western part of Teesside, but its status will be under attack from two directions. First, and much the more damaging, its dominance over western Teesside will be reduced because of the development of district centres at Thornaby and Billingham. Second, if central Middlesbrough succeeds in becoming the regional centre, it will take some of the increase in expenditure by residents in Stockton's hinterland.

14.91 In these circumstances, the minimum provision of shopping floorspace in central Stockton should be that shown in table 14.23, assuming the maximum rate of increase in sales per square foot. The amount of redevelopment proposed for Stockton is sufficient to justify this assumption. The more complex question of whether that amount is compatible with the general aims of shopping policy is considered later in this chapter.

Table 14.23. Shopping floorspace, central Stockton, 1966–91 (million square feet)

	convenience goods	durable goods	total
1966	0.135	0.675	0.810
1981	0.160	0.698	0.858
1991	0.168	0.932	1.100

Redcar, Billingham and Thornaby

14.92 The future growth of each of these centres was planned and, in part, implemented before the appointment of Teesside Survey & Plan. A report on Redcar was prepared in 1965 by Development Analysts, Ltd. They recommended that the shopping floorspace of central Redcar should grow from its present level of 280,000 square feet by their definition, to 400,000 square feet if Redcar were to continue to fulfil its role of a large district centre serving the eastern part of Teesside and parts of Cleveland. The proposals were reasonable and well argued and have been accepted.

14.93 The new town centre at Billingham was about half completed at the time of the survey in the winter of 1966. Since then, further extensions have been made toward the planned size of 213,000 square feet. An even larger district centre is presently under construction at Thornaby. The location for this is well chosen but its planned and committed size of 296,000 square feet is such that the centre is bound in the short term to attract a considerable amount of trade, mainly from Stockton. This is reinforced by the proposal that a substantial amount of floorspace will be taken by a new form of trader, namely, Woolco Ltd., which will be a form of Woolworth's variety store but with concessions granted to a number of other traders.

14.94 Therefore, the proposals for these three centres have been accepted as a commitment. Assuming that 50 per cent of the trade in each of them is in durable goods, and that each is operating at a relatively high level of efficiency, the floorspace provision is likely to be that shown in table 14.24.

Table 14.24. Shopping floorspace Redcar, Billingham and Thornaby, 1991 (million square feet)

	convenience goods	durable goods	total
Redcar	0.164	0.236	0.400
Billingham	0.088	0.125	0.213
Thornaby	0.122	0.174	0.296

Other district centres

14.95 Analysis of the pattern of centres on Teesside in 1966, and the study of North West England, suggest that a typical district centre will serve a relatively well defined hinterland with a population of about 50,000 people. About half of the trade of the district centre will be in durable goods shops. The district centres will thus provide virtually all of the durable goods retail outlets outside the major shopping centres and a substantial part of the convenience goods trade.

14.96 From the preceding analysis, it seems likely that for a district centre to be as large as Billingham was, even in 1966, (116,000 square feet), makes it too big in the sense that it would attract so much trade from the major centres as to reduce their ability to provide comparison shopping.

14.97 A tentative list of district centres has been drawn up and is shown in table 14.25. The estimates of floorspace are based on analysis of the distribution of population recommended for the urban structure policy; on the forecasts of total *per capita* expenditure and likely future rates of sales per square foot of floorspace; and on the criteria of a district centre noted in paragraph 14.96. But before they can be accepted as policy, these figures will have to be subjected to further analysis using the sales prediction model. This is described later in the chapter.

14.98 The new centres are located in the three main areas of future population growth. Two each are located in the south-west, at Levenside, and in the south, at Nunthorpe–Marton where population is expected to grow by 100,000 in each sector. The fifth is a smaller centre at Wolviston (not necessarily in the existing

Table 14.25. Shopping floorspace in district centres, 1966–91 (thousand square feet)

fine zone	1966	1991
(a) *new centres in areas of population growth*		
141 Ingleby Barwick	0	91.0
143 Kirklevington Grange	0	67.0
146 Coulby Manor	0	101.0
61 Marton Grange	0	101.0
194 Wolviston	0	60.0
(b) *expanded centres in areas of population growth*		
56 Ormesby	12.9	46.0
79 Eston	58.0	139.0
143 Yarm	30.2	40.0
185 Marske	48.8	62.0
(c) *stable centres*		
32, 34 Linthorpe	53.8	59.0
172 Guisborough	119.5	123.0
187 Saltburn	62.2	62.0
190 Loftus	65.1	72.0
(d) *declining centres*		
16 Corporation Road, Middlesbrough	101.0	64.0
28, 30 Parliament Road, Middlesbrough	131.5	33.0
23, 24 North Ormesby	118.0	64.0
71 South Bank	167.0	42.0
124, 128 Yarm Lane, Stockton	61.9	36.0
(e) *existing centres, to class as district centres*		
10, 12, 16, 17 Newport Road, Middlesbrough	176.9	0
68 Grangetown	63.3	0
131, 133 Mandale Road, Thornaby	133.4	0

village) where population is expected to grow by about 30,000.

14.99 Six existing centres should grow, by redevelopment or new development, to serve areas of recent or future population growth where shopping facilities of this sort are inadequate. The named centres should, if possible, be the location for this new development. If detailed feasibility study shows that a centre is not physically capable of growth, an alternative, nearby site should be found. This problem may arise at Ormesby and Eston. And a more serious problem may arise at Yarm, where growth should be planned so as to retain the present character of the High Street.

14.100 There are four centres where little growth is expected as the population in these areas will be relatively constant or where it seems unlikely that retail sales could be expected to increase. Nonetheless, redevelopment of these centres could well take place.

14.101 The remaining centres are all existing groups of shops in areas where a sharp fall is expected in resident population. Several of them are very close to the central areas of Middlesbrough and Stockton and the names refer to the particular streets and adjacent areas of corner shops. The aim of policy should be to reduce the area of shopping floorspace during urban renewal and, if necessary, to relocate the centres so that they will be removed from heavily trafficked roads. In three places, the loss of population is so great that there would be no justification for redeveloping district centres though there may still be justification for local shopping facilities.

Local shopping

14.102 The main characteristics of local shopping in 1966 were that about 82 per cent of the total floorspace was for convenience goods shops; that about 72 per cent of all shopping trips for convenience goods were made by walking, that the median time of a shopping trip made on foot was about 8.5 minutes; and that in a selected group of areas, the average *per capita* expenditure on local shopping was about £66 per annum. Local shopping in this context includes a wide variety of shopping facilities such as new suburban centres, shopping centres in rural and mining villages; and in corner shops and small groups of shops.

14.103 The guide lines for policy start by assuming that the figure of £66 *per capita* expenditure is generally applicable. This was the equivalent of about 3.26 square feet of floorspace per person in 1966. If this same proportion of *per capita* expenditure continues to be spent in local shops, then between 3.36 and 4.23 square feet per person will be needed in 1991, depending on the rate of increase in turnover per square foot. This is taken as a guide for forecasting the total future amount of floorspace for local shopping.

14.104 The size of individual centres is more difficult to suggest. However, if the median journey time is about 8 minutes, and average speed of walking is 3 miles per hour, then between 3,500 and 5,000 people could be living within walking distance depending on gross residential density. As the median distance includes one-half of a total population, it seems reasonable to suggest that a local shopping centre could be sustained by a population of between 7,000 and 10,000 people. Thus, depending on gross density, and turnover per square foot, local shopping centres in 1991 could satisfy present patterns of behaviour, and could be viable, if they were between 17,000 and 32,000 square feet. In new residential areas, it would be reasonable to assume high rates of turnover, and therefore a floorspace of about 20,000 square feet should be the average size.

14.105 Therefore, the criteria for local shopping in 1991 should be a total provision of between 3.4 and 4.2 square feet of floorspace per person, located in small centres of about 20,000 square feet serving a hinterland of between 7,000 and 10,000 people. This, of course, would be the criteria for shopping centres in new areas of population growth. But the basic criterion could be used to indicate broad areas in which extra local shopping facilities could be provided.

Total distribution of floorspace

14.106 The final distribution of floorspace between the different classes of shopping centre is shown in table 14.26. This, it must be stressed is a conservative estimate of the total additional requirement of shopping floorspace, particularly as it assumes a relatively fast rate of increase in sales per square foot of floorspace. The division of floorspace between convenience and durable goods shops is fairly approximate. But the division of the hierarchy between district centres and local shopping is even more arbitrary. Rather, there is a continuous rank order of shopping centres which, for the purpose of analysis, has been categorised into district and local. In fact, the largest local and the smallest district centres will be very similar.

Table 14.26. Distribution of total floorspace, Teesside, 1966–91 (million square feet)

		convenience goods	durable goods	total
1966	major centres	0.368	1.689	2.057
	district centres	1.140	0.667	1.767
	local shopping	1.058	0.231	1.289
total		2.566	2.577	5.143
1991	major centres	0.468	3.232	3.700
	district centres	0.912	1.203	2.115
	local shopping	2.381	0.192	2.573
total		3.761	4.627	8.388

The evaluation of shopping policy

14.107 This policy for shopping sets out to foster a regional centre at Middlesbrough; a continued life for Stockton as the major centre for western Teesside; a series of district centres offering a mixture of convenience and durable goods shops easily accessible for people's daily needs; and local shopping centres within easy walking distance of people's homes. The aims of the policy are to improve the image of Teesside and to satisfy people's needs for shopping.

14.108 The policy, however, expresses an ideal set of arrangements to which people and shopkeepers are expected to conform. The quantities of floorspace stemming from the policy are all based on calculations using ratios and the like. Before the policy can be accepted, it is necessary to investigate how people would probably use these shopping facilities, and whether shopkeepers would have prospect of sufficient return on their investment in providing the facilities. A retail market potential model has been used to predict how people's expenditure would be spent at the different shopping centres on Teesside. The resultant distribution of sales can be compared with the distribution of floorspace to establish the probable turnover per square foot. If the predicted rate of turnover per square foot in an area is less than the lowest forecast made in table 14.20, it is likely that the quantity of floorspace in that area would not be commercially viable. If, however, the predicted turnover is greater than the highest forecast for the appropriate type of centre, then there will probably be considerable pressure to provide a greater quantity of floorspace.

The retail market potential model

14.109 The retail market potential model which was used to predict the distribution of sales was that developed by T. R. Lakshmanan and Walter G. Hansen for the Baltimore Regional Planning Council. It was described in full in the *Journal of the American Institute of Planners*, June 1965, and represents a considerable advance over earlier sales prediction models such as the gravity model described by W. J. Reilly in 1928.

14.110 Like the earlier model, this retail model assumes that the size of a shopping centre is directly proportional to the aggregate purchasing power of its customers; and that the cost of travelling to a shopping centre was borne by the customer. But, as the customer will try to minimise these costs, W. J. Reilly's model assumed that customers will inexorably choose the nearest centre that will satisfy his requirements. In this way, he built a system of centres of comparable status, each with its discrete hinterland.

14.111 However, Lakshmanan and Hansen show that this system is an oversimplification. There is, rather, a continuum whereby different centres compete with each other for customers. In a system of competing centres, each centre will attract at least some custom from every part of the area served by that system, although the degree of custom will fall off rapidly with distance.

14.112 Their model takes the form:

$$S_j = \sum_{i=1}^{n} C_i \frac{F_j^{\beta}/d_{ij}^{\alpha}}{\sum_{k=1}^{n} F_k^{\beta}/d_{ik}^{\alpha}}$$

where S_j = sales in the jth centre of a series of n centres;
C_i = retail spending power (= population × *per capita* expenditure) available in the ith zone of a series of n zones;
F_j = the size or attractive power of the jth shopping centre;
d_{ij} = the distance between zones i and j;
α = exponent on distance;
β = exponent on attraction;

14.113 The model thus states that the sales in a shopping centre are:

a directly proportional to retail spending power;
b directly proportional to size of the centre;
c inversely proportional to distance to the consumers;
d inversely proportional to the competition from other centres, the competition is directly proportional to the size, and inversely proportional to the distance to competing centres.

The exponents on distance and attraction are introduced to allow for the situation that, for instance, if a centre is twice as attractive as its competitors it will not necessarily attract exactly twice as many customers, other things being equal.

14.114 In the application of this model to Teesside, the following variables were used for each zone in the coarse zone system, i.e. fifty-eight zones in 1966; seventy zones in 1991; and, for each year, four external zones representing West Hartlepool; Newton Aycliffe; Darlington; Northallerton.

sales, measured in £ per annum at 1966 prices;
population;
per capita expenditure, in £ per annum at 1966 prices;
attraction, in square feet of shopping floorspace;
distance, the geometric distance in miles between zone centroids, multiplied by a factor of 1.33 to give an approximation to the shortest distance by road between centroids, with a correction to permit the river Tees to be crossed only via specified bridges. The computer program for calculating these distances is one of those developed for the transportation evaluation.

The model was used separately for convenience and durable goods sales.

Calibration of the model for Teesside

14.115 The first step in the use of the model was to derive values for the two exponents, α and β. This calibration was carried out by C.E.I.R. Ltd., using a computer program which they have developed. The method is to obtain estimates for α and β by fitting this model to a known series of values for sales, that is, the estimated distribution of sales by coarse zone in 1966. An iterative procedure is followed whereby the program proceeds on a search for the (local) optimum values of α and β from assumed starting values of the two exponents. The optimum values of α and β will be those which result in a (local) minimum to the error sum of squares function in terms of the parameters, that is, roughly, where there is the minimum difference between the actual distribution of sales in 1966 and that predicted by the model. The results of this procedure are shown in table 14.27.

14.116 The procedure for durable goods showed a very rapid convergence with a sharp fall in the standard error

Table 14.27. Calibration of sales distribution model

iteration	*rounded value of exponents* distance (α)	 attraction (β)	standard error of residuals
durable goods			
start	2.00	1.50	4.60×10^{5}
1	2.49	1.38	3.03×10^{5}
2	2.36	1.38	1.87×10^{5}
convenience goods			
start	0.75	0.75	2.84×10^{5}
1	0.35	0.88	2.19×10^{5}
2	0.12	0.97	1.70×10^{5}
3	−0.02	0.98	1.62×10^{5}
4	−0.06	1.05	1.47×10^{5}
5	−0.08	1.05	1.46×10^{5}

of the residuals. This means that the results can be taken confidently to represent at least a sharp local minimum and that the values thus obtained can be accepted as reliable. The cause of this rapid convergence is probably that the distribution of durable goods floorspace is irregular, not closely related to the distribution of population.

14.117 The high value of the exponent on distance ($\alpha = 2.36$) means that distance from a shopping centre is being heavily penalised: the tendency is to keep each zone's expenditure in and near that zone provided it has a centre of reasonable size. Consequently, if a substantial new town centre or district centre is built on the outskirts of a conurbation, it will tend to attract a considerable proportion of the local retail spending power. This leads to the reverse of the problem that had been expected to face, say, the postwar new towns around London when it was feared their shopping centres would not be able to compete with the metropolitan attraction. Instead they were able to compete successfully. Similarly, on Teesside, it seems likely that a new town would prove very attractive, and its sales would rise sharply at the expense of the rest of the area.

14.118 The high value for α, however, may be a consequence of the existing relatively low levels of car ownership and the state of the public transport system, including the frequency and fares on bus services. Both of these factors make it less likely that people would make relatively long journeys to shop. It may be that in the future, with increasing levels of car ownership and an improved public transport and road system, the value for α would tend to fall. That is, the deterrent of distance would be reduced for durable goods trips, and people would travel further afield.

14.119 It is more difficult to comment on the value of the exponent on attraction ($\beta = 1.38$) for durable goods. Its meaning is that the large centres are proportionately more attractive than small centres. This is a consequence of many factors of which one probably is the opportunity offered by the larger centres for comparison and specialist shopping. Probably, too, it is because the larger centres usually have a variety of peripheral activities including recreation, cultural and business activities. Also, the larger centres have a considerable trade from the people working in the centre. For instance, the report on North West England showed that 32 per cent of all shopping trips to central Manchester were made by people coming from work, usually in or near the central area; and that 12 per cent of the shopping trips starting from home combined shopping with other activities.

14.120 It seems conceivable that the attractiveness of the large centre will not diminish, especially if the policy of fostering a regional shopping centre at Middlesbrough is successful. But this is less certain than the probability that the deterrent effect of distance is likely to diminish in future.

14.121 The values of α and β for convenience goods are significantly different from those for durable goods. But the results are, anyway, statistically, much less reliable: the values did not, in fact, converge to the same degree although the rate of change in the standard error of the residuals had become very slow. The trend of the results is towards a value of $\alpha = 0$ and $\beta = 1$. That is, the total sales in a zone equals the total expenditure generated by that zone. That is, shop owners adjust the allocation of convenience goods shopping floorspace so that the sales per square foot is equal in all zones. This is the equilibrium allocation expected by economic theory if the rents for convenience goods shops are equal over the entire area. The slight divergences of α and β from the values assumed for this approximation may reflect differences in rent.

Prediction of sales distribution, 1991

14.122 The calibrated model was used to predict separately the retail sales in convenience and durable goods in each of the seventy coarse zones in 1991, using the forecast population and *per capita* expenditure in each zone and the total amount of floorspace, including local shopping, district and major centres in the zone. The 1966 values of α and β were used as no valid basis could be found for forecasting future changes in their value notwithstanding the comment in paragraph 14.118.

14.123 The full results from the model were analysed by calculating the average sales per square foot in the zone (given by adding the total sales in convenience and durable goods and dividing the result by the total shopping floorspace) and comparing them with the range of values likely to be found in 1991 according to table 14.20. The values in that table are based on an analysis of likely trends arising from improvements in retailing efficiency, redevelopment and consumers' expenditure. As they are an extrapolation of past trends in the sales per square foot for schemes that were commercially successful, the forecasts can be regarded as a rough guide to what will be commercially successful in future. That is, the amount of investment in developing new shopping floorspace, and redeveloping old, depends largely on the sales per square foot that can be attracted to a particular site as it is this which determines the level of rent, and the scheme's profitability. If the sales were less than those forecast in table 14.20, it seems likely that the rent would be insufficient to cover costs of construction and the investment in that amount of floorspace would not occur. Conversely, if the sales were substantially greater than the forecast, it is likely that that location could be the site of a greater amount of floorspace and, consequently, there would likely be a demand for investment interests to extend the shopping centre. The sales for convenience and durable goods were combined in the last analysis as the distinction between the two is, to some extent, arbitrary.

14.124 The results of the initial runs of the model in fact showed several locations where sales differed substantially from those forecast in table 14.20. The variation lay in durable goods as the sales per square foot for convenience goods were relatively constant over the area. The variations showed two clear tendencies. Sales were very low in the inner suburbs, within say two or three miles of the major shopping centres, indicating that the continued high level of sales in the major centres and the redistribution of population away from the older housing areas would lead to a faster decline in the demand for shopping floorspace than had originally been assumed. Revised, lower estimates of the floorspace in these zones were therefore made. Sales were greater than forecast in district centres in the outer suburbs, confirming the comment made in paragraph 14.117. Because of the paramount importance of the need to redevelop the major centres and to create the conditions in which a dominant centre for Teesside could develop at Middlesbrough, the amounts of floorspace originally proposed for several of the new district centres were revised downwards.

14.125 The final run of the model used the figures of floorspace for the major centres given in tables 14.22

and 14.23; for the district centres, in tables 14.24 and 14.25; and for local shopping, based on estimates of the existing provision likely to remain in use and provision in areas of new development by the standards in paragraph 14.105. The results are summarised in table 14.28.

Table 14.28. Predicted sales per square foot, Teesside shopping centres, 1991 (£ per annum, 1988 prices)

coarse zone (1991 system)	predicted sales	forecast range
zones with major centres		
1 Middlesbrough	26.5	23.8–30.5
28 Stockton	28.8	
zones with large district centres		
19 Billingham	32.5	25.4–32.8
35 Thornaby	30.3	
53 Redcar	29.8	
other zones with district centres		
2 Parliament Road, Middlesbrough	29.2	25.4–32.8
5 Corporation Road, Middlesbrough	23.6	
5 North Ormesby	23.6	
8 Linthorpe	25.4	
11 Ormesby	30.8	
14 South Bank	29.8	
15 Eston	32.8	
29 Yarm Lane, Stockton	25.7	
36 Ingleby Barwick	39.5	35.0
37 Kirklevington	45.0	
37 Yarm	45.0	
43 Coulby Manor	38.3	
45 Marton Grange	38.3	
52 Guisborough	38.6	25.4–32.8
55 Marske	47.0	
55 Saltburn	47.0	
57 Loftus	44.3	
70 Wolviston	34.8	35.0

Note: the data for each zone includes all shopping floorspace, including local shopping in convenience goods.

14.126 The model predicts that the sales in central Middlesbrough would be about £89 million, of which 84 per cent would be in durable goods; and that it would attract about 45 per cent of the trade in durable goods in Teesside. These figures would be sufficient to give a rate of turnover within the forecast range of £23.8–£30.5 per square foot. The scheme would therefore probably be viable and would achieve a character likely to be associated with a centre of higher status than the existing centre at Middlesbrough. But the figures indicate an improvement of less magnitude than had been hoped for in the policy set out in paragraph 14.85 as the turnover figures are closer to the minimum figure than is desirable. The reason for this lies in the radistribution of future population and the probable commercial success of the proposed outlying district centres, especially those in the south-west sector, at Kirklevington Grange and Ingleby Barwick, and in Cleveland, especially Marske. To some extent, however, these predictions may be questioned. If the deterrent effect of distance is reduced by higher levels of car ownership and an improved public transportation system, the consequence would be to reduce sales in the outlying, relatively small, district centres and increase sales in the regional centre. But the indication is clear that constraint will be needed to prevent excessive growth of these district centres.

14.127 Sales at central Stockton are predicted to rise to £29 million. The viability of this scale of development seems to be assured, according to the turnover figures, but the relative status of Stockton will have fallen compared with its status in 1966. This is inevitable for the reasons set out in paragraph 14.90. It is clear, however, that many of the same factors affect the future of Stockton as at Middlesbrough.

14.128 There is the further problem at Stockton that there are current proposals for the redevelopment of the eastern side of the High Street. The general planning considerations about this are described in Volume I, chapter 10. In terms of floorspace, the scheme provides for an additional 125,000 square feet of shopping floorspace and the possibility of a further 66,000 square feet for a department store, apart from the replacement of existing users. If the scheme were completed within, say, ten years, it would provide Stockton with about 150,000 square feet more than is strictly required according to table 14.23, and, if this increment were carried forward, total floorspace would rise to 1,250,000 square feet by 1991. The sales model was used to predict the consequences. It showed that although total average sales per square foot would still lie within the forecast range, it would be less than that for the smaller amount of 1,100,000 square feet. That is, the additional floorspace would not attract a proportionate increase in sales.

14.129 A general pattern for the district centres is clear from the predictions. Those located in the older residential areas are not likely to be commercially attractive. Most are in areas where population is likely to fall as a consequence of redevelopment. Most of them, too, are very close to the central areas of Stockton and Middlesbrough. These are the centres at Parliament Road and Corporation Road, Middlesbrough; Linthorpe; North Ormesby; South Bank; Yarm Lane, Stockton. In each of them, the total floorspace is expected to be much reduced as a consequence of redevelopment. It seems clear that, as a whole, the approximate quantities of floorspace set out in table 14.25 may be viable but that too high a proportion has been assumed for durable goods. Therefore, it is very likely and reasonable that in these centres the proportion of durable goods should be much smaller.

14.130 Another group of district centres will be highly successful, in the commercial sense, if the predictions of future sales prove correct. These are the brand new district centres at Ingleby Barwick and Kirklevington Grange; and the expanded centres at Marske, Saltburn and Loftus. Yarm High Street is a special case in that it is located in the same zone as Kirklevington. The division between the two centres is deliberately that Kirklevington should be much larger, and that Yarm High Street should retain its present character. The group of district centres is the furthest removed from Middlesbrough and Stockton and this, rather than their size, is the main cause for their success. If, in future, distance proves less of a deterrent to making lengthy shopping journeys, it is probable that these centres will be less markedly successful than has been predicted by the sales model. Otherwise, these centres will be so successful that demand will probably be generated for a greater provision of floorspace, in larger district centres.

14.131 Other district centres, including the existing centres at Billingham, Ormesby, Eston and Guisborough and the new centres at Coulby Manor, Marton Grange and Wolviston, will each have a turnover which will ensure their success but not to such a degree that there will be great pressure for a larger amount of floorspace than has been proposed in table 14.25.

14.132 The remaining district centres each requires a special comment. First, the sales predicted for Redcar are such that it will clearly be successful by the criterion of turnover per square foot. It is possible that if the demand for additional floorspace at Marske and Saltburn is frustrated then there may be a demand for additional floorspace at Redcar. The situation at Thornaby town centre is likely to be roughly similar to that at Redcar.

The sales predicted for the centre are a bit low when compared with the probable turnover in new shopping centres in 1991. But, if the demand for more new shops at Ingleby Barwick and Kirklevington is frustrated, then Thornaby may be the next most favoured site.

14.133 The predicted turnover per square foot in convenience goods, which forms the bulk of the local shopping facilities, is consistently uniform in all the coarse zones, varying within the range forecast for turnover in table 14.20. This, of course, is an inevitable consequence of the value of the exponents used in the model and of the fact that the planning policy was to distribute future local shopping floorspace in direct ratio to the population. The relatively large size of each zone means that the model is incapable of distinguishing between different patterns of local shopping within a zone.

Conclusion: recommended shopping policy

14.134 The chief aim of shopping policy is to create the conditions for the growth of a regional shopping centre at Middlesbrough. Strictly from a commercial point of view, it seems likely that an increase in shopping floorspace from 1.2 million square feet in 1966 to 2.6 million in 1991 will attract a volume and variety of retail sales that would be characteristic of a regional centre and would be viable. Anything less than this would be unable to compete with the distant district centres which, though unable to offer the choice of goods open to the regional centre, would be much more conveniently located.

14.135 Other activities will be a necessary part of the regional centre. The full complex is described in Volume I, chapter 8. It should be remembered, however, that these other activities will themselves generate retail sales within the regional centre. The sales distribution model was designed to analyse the pattern of expenditure only on shopping journeys starting from home.

14.136 However, the policy is not guaranteed of success and a continuous examination of the main criteria should be made. These are the turnover per square foot; the proportion of expenditure in Teesside that is attracted to the centre; the proportion of the centre's trade that is in durable goods, and the shopping patterns of behaviour, especially the degree to which people from the further parts of Teesside use the regional centre.

14.137 The situation at Stockton is more complex as a course has to be charted between opposing tendencies. The centre has to be large enough to compete with the district centres at Thornaby and Billingham; but has not to be so large that it will attract too much custom from Middlesbrough, and this policy for urban structure has to be followed in the difficult context of maintaining something of the aesthetic character of Stockton High Street. The quoted figures, rising from 0.8 million square feet in 1966 to 1.1 million in 1991, are probably reasonable in strict, quantitative terms. But it is a relatively small increment of new floorspace which may not be sufficient to sustain the redevelopment and modernisation of the existing floorspace.

14.138 However, proposals are in hand for the comprehensive redevelopment of part of the central area of Stockton. These proposals, if implemented and commercially successful would add an additional 191,000 square feet of shopping, including a department store. It is important that this redevelopment should not affect the assessment of the total amount of floorspace required during the twenty-five years and that it should be phased to avoid too rapid an extension of Stockton's shopping. But the same proviso about continuous review should be applied to Stockton as to Middlesbrough.

14.139 The location and quantity of floorspace for district centres should be that set out in tables 14.24 and 14.25, the rate and timing of development being related to residential and transport developments. But there are two provisos to this policy. The first concerns the new district centres at Kirklevington and Ingleby Barwick, and those at Saltburn, Marske and Loftus. Each of these centres is of a size and in a location where it is likely to be so successful that there will probably be considerable commercial pressure for additional shopping as the residential development of these areas proceeds. These pressures, especially those in the south-west, should be resisted by the use of planning powers unless and until the redevelopment and growth of central Middlesbrough has achieved success. In this context, success means that the key criteria mentioned in paragraph 14.136 are being satisfied. Further, any tendency for this commercial pressure to be transferred to Redcar or Thornaby should also be resisted, for the same reasons.

14.140 However, in the interest of possible long-term growth beyond 1991, the district centres at Kirklevington Grange and Coulby Manor should be laid out in a way which would permit further growth, if this were then judged desirable. These two centres are mentioned because of their location relative to possible directions of future growth of Teesside beyond 1991.

14.141 The second exception for the district centre policy concerns the older centres in areas of declining population, including, particularly, those in north Middlesbrough at Corporation Road and Parliament Road, at North Ormesby and South Bank, and along Yarm Lane, Stockton. It is likely that none will be a viable proposition as a district centre in which a significant amount of its trade is in durable goods. Rather, they will be large, local shopping centres mainly supplying convenience goods. As such, the criteria for size should strictly be more in line with that for local shopping.

14.142 Finally, the local shopping policy should, in general, be along the lines set out in paragraph 14.105. This applies particularly to provision for future residential development, and to filling the gaps in recent housing areas. The standard could well be somewhat greater in older residential areas where rents are lower and, therefore, lower rates of turnover would be acceptable. This would apply in the case of the centres in North Ormesby and elsewhere.

14.143 The final shopping policy is shown in figure 14.2. It must be stressed, however, that it is a generalised policy for shopping as part of an urban structure policy. The conditions in any particular locality at a particular time will still need to be examined before either the design of shopping centres, or particular development control decisions could be made.

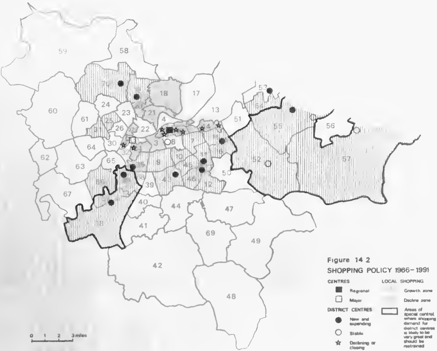


Figure 14 2
SHOPPING POLICY 1966–1991

15 Teesside university and polytechnic

15.1 The provision of institutions for higher education at Teesside was mentioned in the *North East White Paper* and formed an important part of *Challenge of The Changing North* with its stress on technological development. The aims were to relate higher education on Teesside to its industrial development, and to give more opportunities for higher education in an area where the proportion of young people remaining in full-time education above the school leaving age was comparatively small. The original proposal was for a technological university, that is one in which education and research in science and technology would predominate and which would develop close links with local, science-based industries on Teesside. However, in its later thinking, the Government gave greater priority to the development of a polytechnic in which part-time as well as full-time education would be important.

15.2 The role and priority given to the two types of institution were quite different:

a the university would be a longer term project of lower priority; it would be a national institution, drawing its students from all over the country, and the students would be in full-time residence at the university;

b the polytechnic would be an urgent project of high priority; it would serve both full-time and part-time students, both residential and non-residential; and the students would be mainly from Teesside and its immediate vicinity.

15.3 The planning requirements to be taken into account in selecting sites for the two were thus quite different. This chapter describes the argument leading to the recommendation that a site be reserved at Ormesby Bank for the university; and that the polytechnic be developed on land at Middlesbrough central area, as an extension of the Constantine College of Technology.

Teesside university

15.4 The history of the selection and recommendation for a site for a technological university at Teesside started in 1963 when the Teesside University Promotion Committee invited local authorities to suggest suitable sites. Fourteen sites were put forward and, in 1966, Teesside Survey & Plan was asked to investigate these, and other possible locations for a university within the context of an urban structure policy for Teesside.

15.5 Three criteria entered the comparative analysis of sites. The first was the requirements of the university according to the Promotion Committee. These were:

a at least 500 acres of land;

b between 3,000 and 4,000 residential students, with room for expansion to 5,000 students or more;

c the earliest date for construction to begin would be 1975;

d close collaboration with industry is envisaged, for training and research;

e much of the development would be single storey construction.

15.6 The criteria for the university as part of an urban structure policy were:

a suitable relationship with the needs of long and short term land use planning;

b suitable relationship with the present and proposed transportation systems;

c in accordance with the general principles for the development of landscape and environmental quality;

d reasonable accessibility to the main industrial areas and central area of Teesside.

15.7 Finally, the special role of a university was recognised: it would be of great importance in helping to create a new, attractive image for Teesside. For this reason, the existing and potential quality of a site for the university should be of the highest order.

15.8 Seventeen sites were considered; they comprised the fourteen suggested by the local authorities, together with three additional sites which were thought to be worth examining for their potential contribution to urban structure. The sites are shown on figure 15.1. The following brief notes indicate the relevant factors in selecting sites 8 and 17 for further consideration.

Sites 1, 2, 3 (Submitted by Billingham U.D.C. and Stockton R.D.C.)

These sites around Wolviston satisfy most of the requirements, although their landscape quality is ordinary rather than exceptional. The sites include most of that land which, for reasons of topography, climate and landscape quality, is regarded as suitable for housing development associated with the growth of industry on the north bank of the Tees. If long-term economic growth is to be achieved, this land should be reserved for housing rather than a university.

Sites 4, 5, 6 (Submitted by Redcar M.B.C.)

Site 4 is adjacent to ICI Wilton and Redcar Racecourse; it contains only 300 acres and is flat and characterless. Sites 5 and 6 together total only 385 acres and are separated by the Saltburn to Middlesbrough railway line. They are smaller than required, are flat, characterless, and almost devoid of trees, yet they both consist of high quality agricultural land. All three sites have reasonably good access to the rest of Teesside along the South Teesside Parkway. In view of their limited size, poor landscape quality, and high

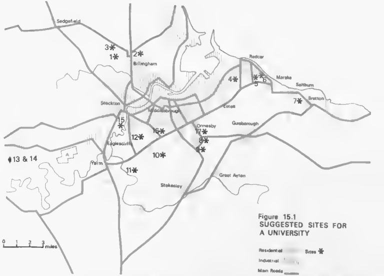


Figure 15.1
SUGGESTED SITES FOR
A UNIVERSITY

agricultural value, it is considered that none of them are suitable for a university.

Site 7 (Submitted by Saltburn & Marske U.D.C., and Skelton & Brotton U.D.C.)

This site offers ample land of high landscape value in a coastal location close to Saltburn, which could form the nucleus of a suitable university town, both architecturally and because of the availability of large premises suitable for student housing. In this sense, the university might help to reduce seasonal unemployment in the town. However, access to the main urban area of Teesside and to the existing industrial area of the north bank is difficult. Moreover, in the context of a long-term plan which excludes major coastal development, a university on this site would be unrelated to the direction of urban growth and unable to influence development strategy.

Site 8 (Submitted by Guisborough U.D.C.)

This site is considered in greater detail in the next paragraph, as part of a larger area including site 17.

Sites 9, 10, 11 (Submitted by Stokesley R.D.C.)

Sites 10 and 11 at Hemlington and Hilton are on the best available quality agricultural land which the Ministry of Agriculture would, in general, wish to retain in agricultural use. As the quality of landscape is not good enough to counter the loss to agriculture the sites were rejected. Site 9 is less accessible than site 8, and located in a less attractive landscape.

Site 12 (Submitted by Middlesbrough C.B.C.)

This site lies between the western boundary of Middlesbrough and the proposed line of the A19 diversion. It contains 630 acres of land in a location of good general accessibility and with particularly good access to Stockton and Middlesbrough central areas. However, the landscape quality is relatively poor, and the setting, amongst suburban housing, is not attractive. Moreover, the strip of open land around Stainsby Beck does have permanent value as a break between the built-up areas. It should be improved by landscaping and retained as open space.

Sites 13, 14 (Submitted by Darlington C.B.C. and Barnard Castle R.D.C.)

Both sites lie west of Darlington and are remote from Greater Teesside and its industrial foundation. Neither site is considered to be suitable as a location for a technological university working in parallel with industry.

Site 15

This site at Bowesfield Lane is immediately south of Stockton and west of the river Tees. Ample land is available and proximity to Stockton town centre would be advantageous. The Tees provides a potential amenity of a high standard. However, the proposed primary road network shows that both the realigned A66 and the South Teesside Parkway would cross the site. These cause major severances and create environmental problems which would militate seriously against the satisfactory development of a university.

Site 16 (Submitted by Middlesbrough C.B.C.)

This site of about 540 acres lies north of the proposed South Teesside Parkway at Tollesby Farm. It has good access to regional routes and to Middlesbrough central area. The landscape, apart from an exceptional avenue of trees leading to Acklam Hall, is of moderate quality. The land is agriculturally of high quality and is valuable as a wedge of open space between two substantial arms of suburban development extending towards Hemlington and Marton. The green wedge will become important as the development of Hemlington proceeds. The site has no special locational or landscape attractions which would outweigh the disadvantages of using it for a university.

Site 17

This site is considered in detail in the next paragraph.

15.9 The selected location recommended for the university is on sites 8 and 17, taken together, not as alternatives. The boundary of the total area of 790 acres at Ormesby Bank is shown on figure 15.2.

15.10 The southern half of the site, south of A171 to Guisborough, is flat. Part of this area, at Upsall Carrs, shows signs of poor surface water drainage. This problem might be turned to advantage by the creation of a small lake as a balancing reservoir and an appropriate landscape feature.

15.11 The site north of A171 is a shoulder of Eston Hills which rises to a prominent cluster of minor peaks at 500 feet above sea-level and includes a few slopes steeper than one in ten. Whilst it would be necessary to avoid expensive constructional work, this part of the site would provide a fine setting for the design of university buildings. Part of this section was formerly worked for ironstone and some of the wooded areas on the hill tops mask former workings. A detailed survey would be needed to establish their exact location and possible effect in determining the size and placing of buildings. It is likely, however, that the wooded areas would be retained as natural landscape.

15.12 The northern part of the site is fairly exposed, although the maturity of the trees on the crown of the hill indicates that the level of exposure is tolerable. The south facing slope of Upsall Hall, and the flatter area of Upsall Carrs are sheltered.

15.13 Most of the site is currently either in agricultural use or is relatively mature woodland, including plantations and natural forests. Two small brickworks are located near the north-east boundary of the site, in deep woodland on the north facing slopes.

15.14 There is existing residential development near Swan's Corner (the intersection of A171 and Ormesby Bank) and below the hilltop of Ormesby Bank itself. The proposed line of the South Teesside Parkway, which would be the northern boundary of the site, has been accepted by the Government as the effective southern boundary of future residential development in this area. Upsall Hall, already in the ownership of the North Riding County Council, would form an early base for the university.

15.15 The site is well located in relation to the proposed primary road system for Teesside. It would have access to this system via A171, which would pass through the site and thence to the proposed Marton Motorway to

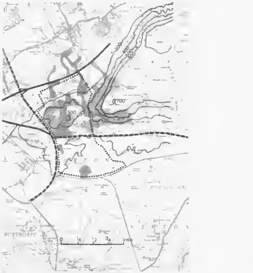


Figure 15 2 RECOMMENDED UNIVERSITY SITE, ORMESBY BANK

Boundary of site
Areas of steep slopes
Wooded areas
Proposed road system

central Middlesbrough, and to the South Teesside Parkway. Access by rail would be nearby at Nunthorpe Station.

15.15 The site is some 790 acres in size, more than would be strictly required for the university. But it could be developed for the university in a setting of public open space, for no other site has the advantages of Ormesby Bank both from a strategic and an environmental point of view. The northern hill area is crucial to this concept. It is visible from the whole of the built-up area and conversely it commands a wide panoramic view. Urban Teesside is spread like a map to the north. The undulating farmlands flow away westward to the distant Pennines. To the east, the sweeping ridge of Eston Beacon stands out against the sea, and the dramatic line of the Cleveland Hills rises abruptly from the agricultural plain to the south. The lower flat lands, in their turn, offer the extensive areas needed for teaching and research departments of the university.

Teesside polytechnic

15.17 The proposal for a polytechnic to serve the whole of Teesside and the adjacent areas was contained in the White Paper on *Higher Education* (H.M.S.O., Cmnd. 3006, 1966). The polytechnic, which would include Constantine College of Technology, Middlesbrough, would have at least 2,000 full-time and 2,000 part-time students, compared with an enrolment of about 550 full-time and 2,280 part-time and evening students at Constantine in 1966–67.

15.18 The new polytechnic would require teaching and administrative buildings, and hostels for about 750 students, at an estimated cost of about £4.9 million. A start would be made on construction of the first stage within five years, and work was started on the first hostel, for 100 students, during 1968.

15.19 The choice of a location for the polytechnic lay between a site at Middlesbrough central area and a site on undeveloped land at Saltersgill, two miles south of the central area, near the South Teesside Parkway.

15.20 The selected location near Middlesbrough central area lay between the shopping centre and Albert Park, east of Linthorpe Road (see figure 15.3). The existing Constantine College, in newly constructed buildings, is at the north of this site. It formed part of a

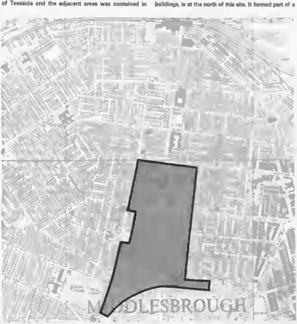


Figure 15 3

RECOMMENDED POLYTECHNIC SITE, MIDDLESBROUGH

▨ The site

0 ¼ mile

further education precinct that had been proposed in the town centre map, approved in principle by Middlesbrough Council in May 1965. This precinct was intended to contain the Constantine College, a central college, an adult institute and central youth premises, on a total area of about 13 acres.

15.21 The additional area between the precinct and Albert Park covers about 27 acres and includes the following land uses:

a an area of about 500 dwellings of poor quality including scattered corner shops. Few of these are in such poor quality as to be included in current slum clearance programmes, but the entire area is identified as requiring extensive rehabilitation during the 1970's including the necessary clearance of a high proportion of the existing dwellings (see chapter 9, Volume II and chapter 12, Volume I);

b a small area of about fifty dwellings of better quality and of larger size at the south of the site, near Albert Park;

c the Middlesbrough maternity hospital at Park Road North, which is to be closed in the re-organisation of hospitals on Teesside;

d the frontage to Linthorpe Road, a mixture of commercial and residential uses;

e land in local authority ownership, including the island site between Linthorpe Road and Park Road North, which is largely cleared; and old age persons' hostel; and a number of houses on the line of what had been an intended extension of Albert Road to the park.

15.22 The reasons for suggesting this particular site in central Middlesbrough are developed at length in chapter 8, Volume I, in the context of a comprehensive plan for the land use and circulation in the area. The main problem likely to be encountered in developing the site is the relationship between the timing of the construction programme for the polytechnic and the treatment of the housing in the area.

a The first stage of development, the construction of a hostel for 100 students, can take place on the cleared site in local authority ownership at Park Road North.

b Subsequent construction would be preceded by the clearance of houses in this area. The eventual clearance of the housing and its redevelopment for the polytechnic will add to the total cost of the project, by making necessary the provision of land for the replacement of these dwellings; and by making necessary their acquisition possibly at an earlier date than would have been required by their rehabilitation and redevelopment purely for housing purposes. However, the additional capital cost involved would be a comparatively small percentage of the total cost of the combined exercise of building the polytechnic and treating the housing in the area; and the effect on the housing programme for Teesside, described in chapter 10, would be very slight.

c Any further, long-term development could take place further east, in the vicinity of Waterloo Road. However, 27 acres should be sufficient to meet the requirements for educational and administration buildings, hostels and open spaces. Land for playing fields could be found on cleared sites in the Newport Road–Cannon Street area.

15.23 The alternative site under consideration was at Saltersgill Farm, where an area of nearly 70 acres was in the ownership of Middlesbrough Corporation and designated for education purposes on the Town Map, though not specifically for a polytechnic.

15.24 The arguments in favour of the central area site were:

a a central area location would offer greater ease of access for students, many of whom could be travelling from different parts of Teesside; the Middlesbrough central area will be the focus of the public transport system and will be highly accessible by road, but Saltersgill will not be well served by public transport;

b the staff and students of the polytechnic, and the other educational institutions, will bring into the vicinity of the central area purchasing power and a demand for a variety of commercial, cultural and recreational activities;

c the polytechnic would provide the means and opportunity for redeveloping an area of poor quality housing with buildings and uses which could add scale and variety to the environment of the regional centre for Teesside. There are few, if any, alternative forms of investment which could achieve so much in a comparatively short time. In particular, the deferment of the proposed Teesside university until after 1975 means that it will not contribute to the development of Teesside in any capacity for many years.

15.25 The Saltersgill site would have had the sole advantage of being physically easier to develop. But it would have been comparatively isolated from the commercial core of Teesside and relatively more difficult of access by public transport. The strongest argument however is that it would have removed from the central area one of the few major, committed pieces of investment that could do much to create a truly regional centre for Teesside at Middlesbrough.

15.26 For these reasons, the site at Middlesbrough central area was recommended and was accepted in principle by Middlesbrough Corporation.

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